# BELL LABORATORIES

# RECORD

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**THE COVER:** Springtime at Murray Hill.

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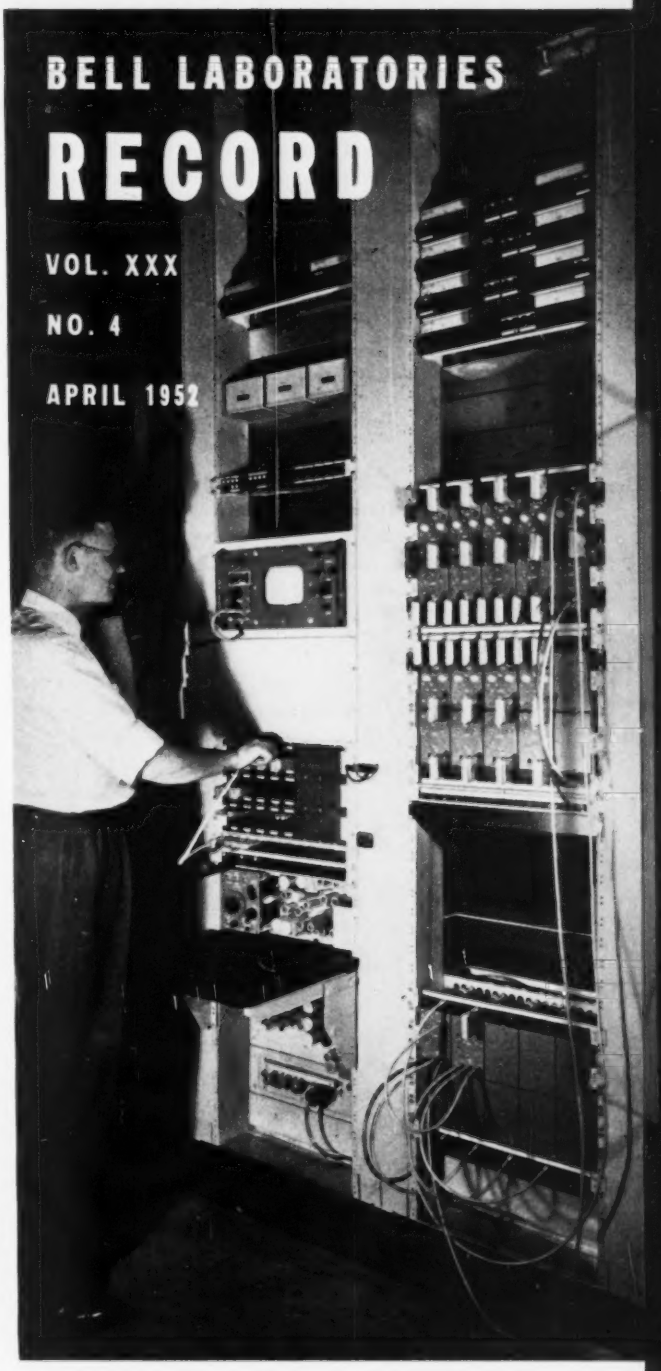
# TD-2 Radio Switching and Monitoring Equipment

**J. A. WORD**
*Transmission Development Department*




*Monitoring and patching bays. The jack field under the operator's hand provides access to incoming line facilities and to FM terminal circuits.*

When the TD-2 radio relay system between New York and San Francisco is completed to its maximum capacity, it will provide six two-way broad-band channels extending completely across the country. In this transcontinental circuit there are 107 relay stations including terminals, with an average spacing of about 28 miles. With the large amount of electronic apparatus that such a number of repeaters require, it is essential to provide switching arrangements that will permit an impaired channel to be quickly replaced by a spare channel. Switching for such purposes is called maintenance switching, and at specific intervals repeater stations have been equipped with patching and monitoring bays to make such switching possible. Such stations are called main repeater stations, while the intervening stations are called auxiliary repeater stations. On the average the main stations will be from 150 to 200 miles apart, but depending on the type of terrain and on economic conditions, this spacing may be greater or less than the average.

Besides the provisions for maintenance switching, it is necessary also to provide for program switching. Each TD-2 channel will carry either a group of several hundred voice circuits or one television circuit. At various places it may be necessary to drop

off television circuits for local broadcasting or for transmission over branch circuits. It may also be necessary to pick up television programs from local studios or branch lines. Maintenance switching is under control of the maintenance crews at "attended" main repeater stations, or over C1 alarm systems at unattended main stations, while program switching is controlled from a Television Operating Center (TOC) on a remote control basis over facilities other than the alarm system. Both maintenance and program switching is done at patching and monitoring bays to which are brought the 70-mc IF output of the radio receiver and the 70-mc IF input of the radio transmitter. Wherever the amount of switching makes it feasible, it is desirable to have the program switching equipment in one bay and the maintenance switching equipment in another to decrease the possibility of switching errors.

To meet the needs of the various switching requirements, two additional switching elements have been provided: a switching amplifier, and a distributing amplifier, both working in the 70-mc IF band. The switching amplifier enables a single output circuit to be connected to either of two input circuits. A simplified schematic of the amplifier is shown in Figure 1. Each input circuit feeds a single-tube amplifier stage, and the outputs of both amplifiers are connected in parallel to a single output jack. The bias voltage of each amplifier is under control of an external two-position dc switching circuit, one position of which applies normal operating bias to the first tube and cut-off bias to the second. The second position of the switching circuit merely reverses the bias of the two tubes, providing a transfer of the common output from the first to the second input.

The IF distributing amplifier circuit, shown in Figure 2, is a four-tube two-stage amplifier which permits one circuit to supply three branches. The input to this circuit feeds a single stage amplifier. At the output of this stage, the circuit branches into three separate tubes in parallel, each having its own output jack. Since only switching and distributing functions are performed, all the amplifiers have been designed as zero gain devices, that is, the input and output levels are the same. Both the switching and distributing amplifiers are shown in Figure 3. At main repeater stations equipped for maintenance switching only, these amplifiers are arranged as indicated in Figure 4, which shows switching and distributing amplifiers for only one

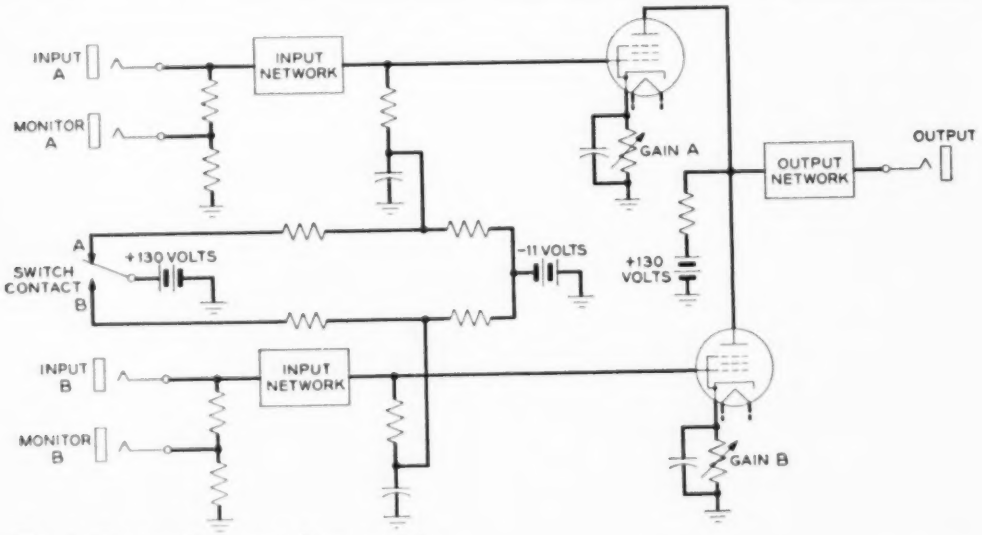



*Fig. 1—Circuit of the switching amplifier.*

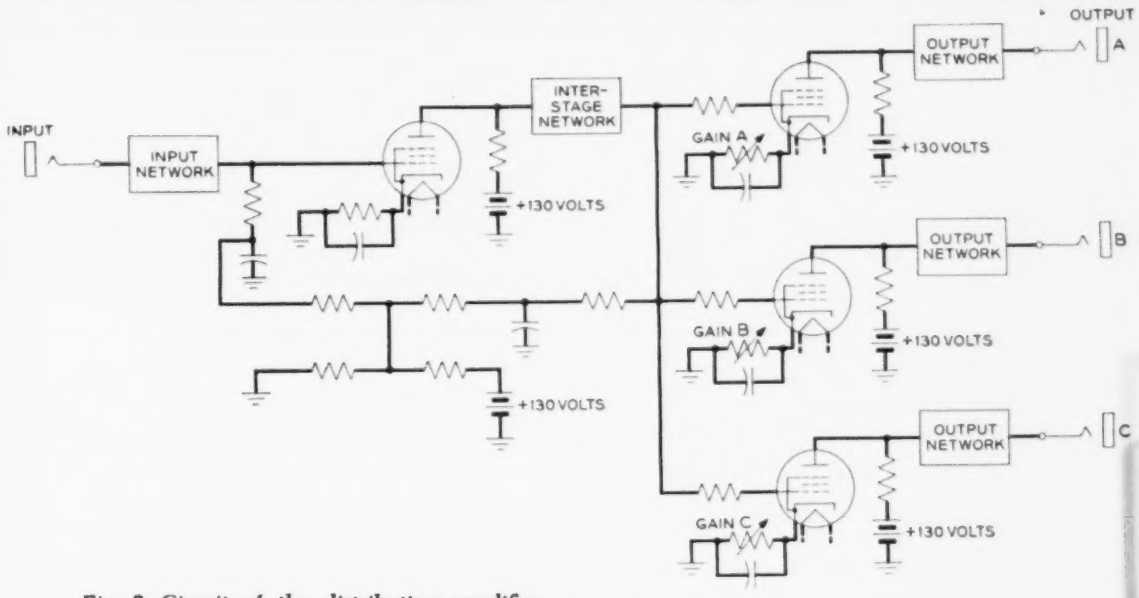



*Fig. 2–Circuit of the distributing amplifier.*

channel in each direction patched as they would be for normal through transmission. The equipment enclosed by solid lines is at the patching bay. Also on the patching bay are jacks connecting to a television monitor through an amplifier and an FM receiver in the monitoring bay.

The patching and switching required to transfer one circuit from the regular to a spare channel is indicated in Figure 5. At station "A" one of the outputs of the working channel distributing amplifier is patched to the radio transmitter of the spare channel. At station "B" the spare channel radio receiver output is patched to input B of the working channel switching amplifier. This input branch of the amplifier is monitored (television service only) to make sure that a signal is present, and then the bias control switch is operated to cut the spare channel into service and to release the regular channel for maintenance.

To facilitate setting up patches as required, the switching and distributing amplifiers together with the necessary jacks are usually arranged on the patching bay as indicated in Figure 6, which shows the arrangement for four channels only. If all the channels are used for voice transmission, this maintenance patching is all that is required. When some of the channels are used for television, however, there will also be need for program switching at some of the main repeater stations. Under these conditions an additional switching and distributing amplifier is associated with the

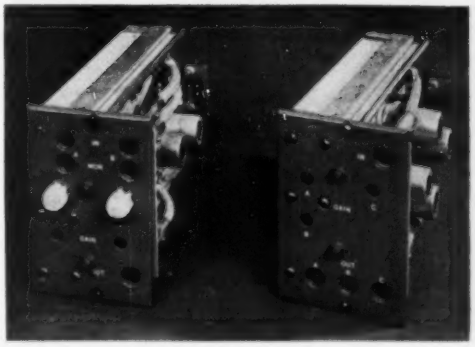


*Fig. 3–A switching amplifier at the left, and a distributing amplifier at the right.*

channels involved in the manner indicated in Figure 7. Under these conditions the left-hand switching amplifier and the right-hand distributing amplifier correspond to those shown in Figure 4, and are used only for maintenance switching, while the other

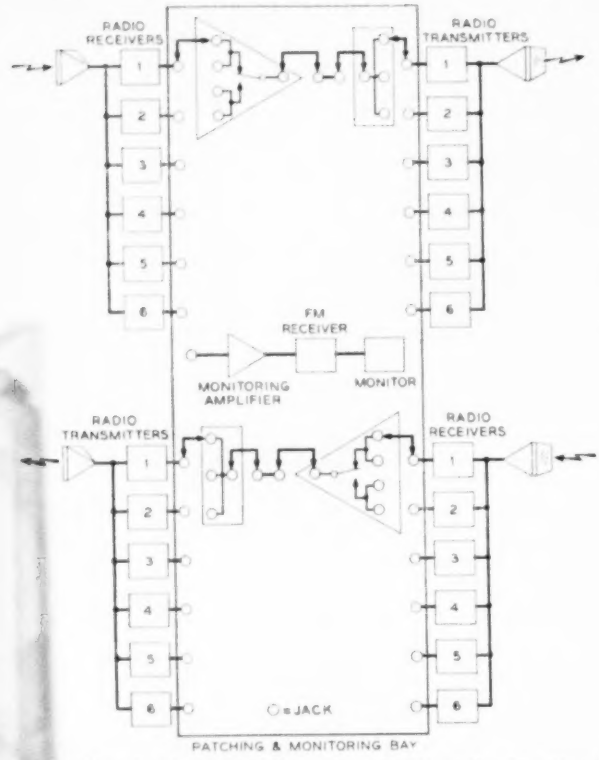



*Fig. 4—Simplified diagram indicating the functional arrangement of the switching and distributing amplifiers for maintenance switching. Amplifiers for all but one channel in each direction are omitted.*

two amplifiers are used for program switching. This permits the program patches to be set up and switched entirely independently and without being affected by any maintenance switching that may be required. Where there is a sufficient number of amplifiers to warrant it, the amplifiers and jacks for program switching are generally on a separate bay as already mentioned.

When provisions must be made for dropping off any one of a number of television channels to a local station or branch circuit, additional switching amplifiers are used as indicated in Figure 8. This shows the arrangements for selecting any of 2, 4, or 6 channels for connecting to a branch line or local television transmitter. For picking up a local program for connection to one or more of the through channels, one or more distributing amplifiers are employed. When provisions must be made for connecting the pick-up to not more than three through circuits, a single distributing amplifier will suffice, while if it is necessary to permit the pick-up to be connected to more than three channels, two or three distributing amplifiers will be used as indicated in Figure 9. The selection of the channel or channels to which the pick-up will be connected will be accomplished by the right-hand switching amplifier of Figure 7.

In some instances it is necessary to drop

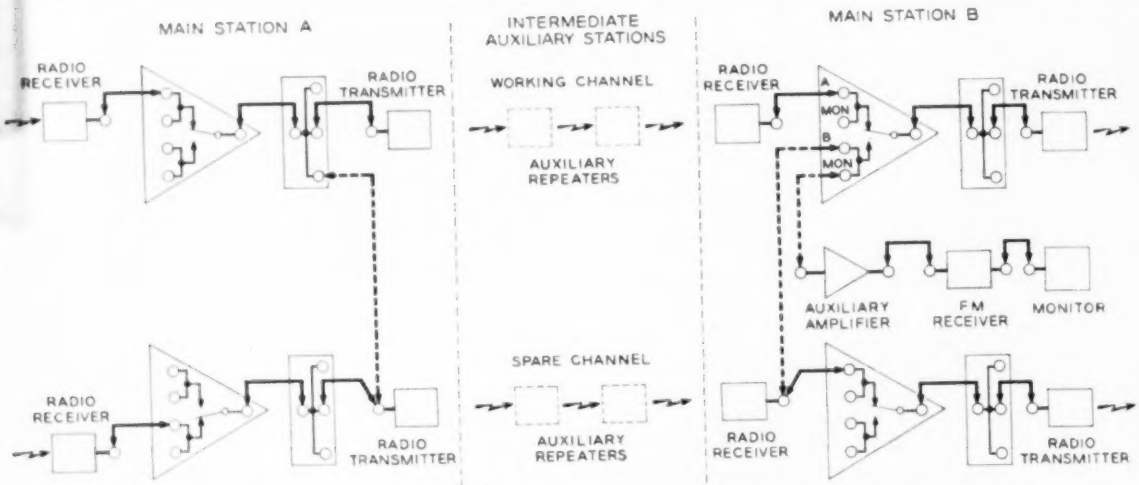



*Fig. 5—Method of patching at each end of a defective link to substitute a spare channel.*

a television circuit at an auxiliary repeater station. At auxiliary stations the IF circuits are connected directly from radio receiver to radio transmitter within the repeater bay. Figure 10 shows how the program dropping problem is handled at an auxiliary station. The connection to the through circuit is a high-impedance low-level monitoring tap which requires that additional amplification in the form of an auxiliary amplifier be provided in the dropped circuit. The necessary patches are set up permanently, but the switching is carried out by remote control. Wherever it is necessary to drop off television circuits for local use, as is shown in Figure 9, FM terminal equipment is provided. At main and terminal stations, the IF connections to the terminal circuits appear in the IF patching bays. The video connection to these circuits appear in a jack field in the monitoring bay. Availability of both sides of these circuits permits monitoring, testing, and quick replacement of circuits. A separate frame of equipment provides the IF and video monitoring facilities for main and terminal sta-

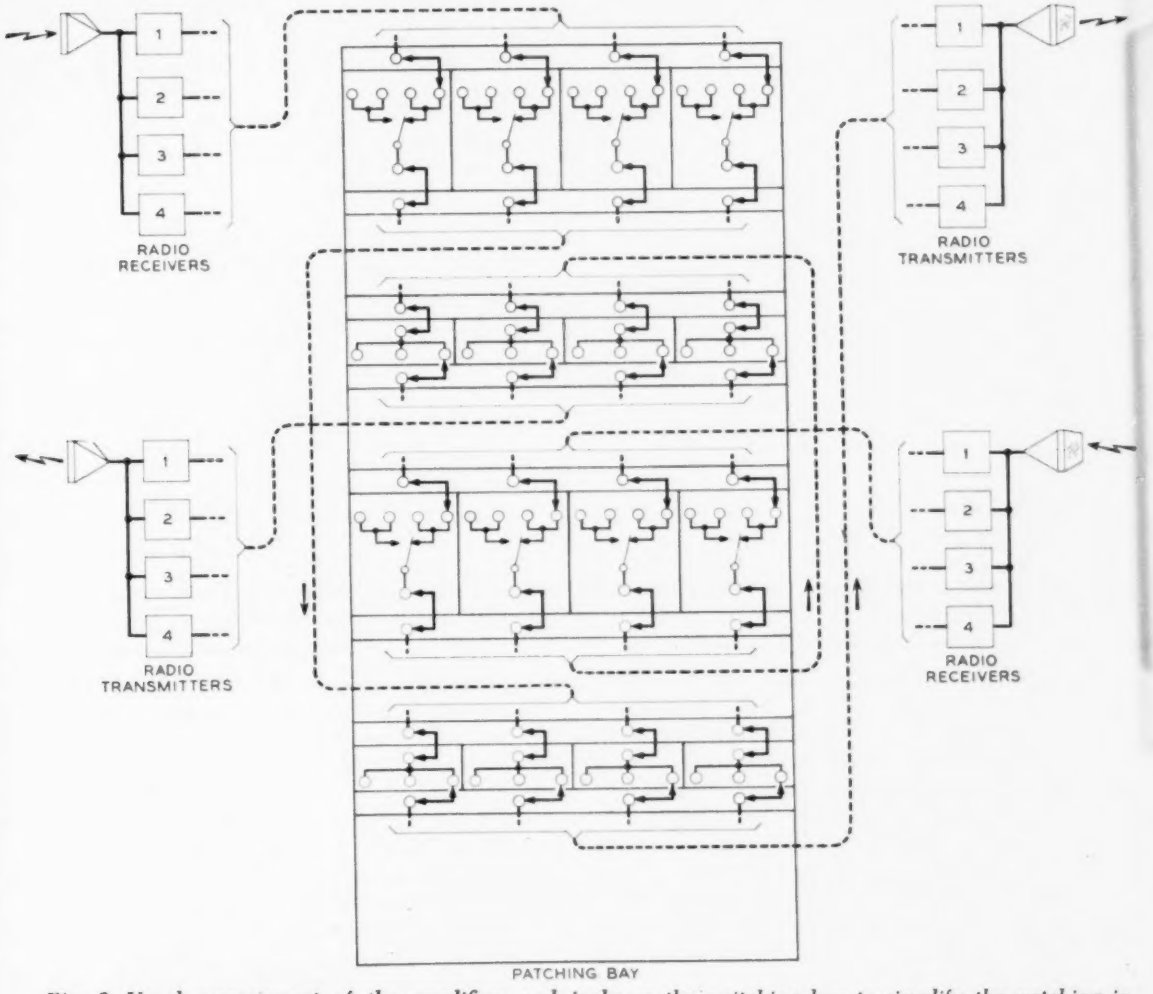



*Fig. 6–Usual arrangement of the amplifiers and jacks on the switching bay to simplify the patching in or out of spare channels.*

tions, and is always closely associated with the IF patching frames. A television picture monitor is used for program monitoring. This monitor requires a video frequency input signal. For monitoring on IF circuits it is necessary to convert from IF to video which is accomplished with an FM terminal receiver identical to those used at terminating points of all video channels. For monitoring working circuits, the monitoring connection must be made on a high-impedance low-level basis to avoid bridging losses on the observed circuit. An auxiliary IF amplifier is provided in series with the monitor to raise the levels when monitoring at IF. A video monitoring amplifier is provided for monitoring at video frequencies. When monitoring directly on the outputs of the circuits rather than through low-level bridging taps, the amplifiers are not required. The picture monitor of course is used only for program observation and not for observing channels carrying message signals.

In the monitoring bay, shown at the left of the photo at the head of this article, the auxiliary IF amplifier is the lowest unit. The FM terminal receiver for monitoring is just below the shelf. The video monitoring amplifier is the first unit above the shelf. The two rows of jack equipment above this unit provide for order wire appearances and for jack connections to the monitoring amplifiers and to the picture monitor. The large jack field under the operator's hand provides access to the incoming line facilities and to the FM terminal circuits. Miscellaneous alarm lamps, video line coils, and fusing arrangements are provided in the upper portion of the bay.

For observing wave form, an oscilloscope is required. This oscilloscope is provided in a rolling console and is part of the equipment required for maintenance of FM ter-

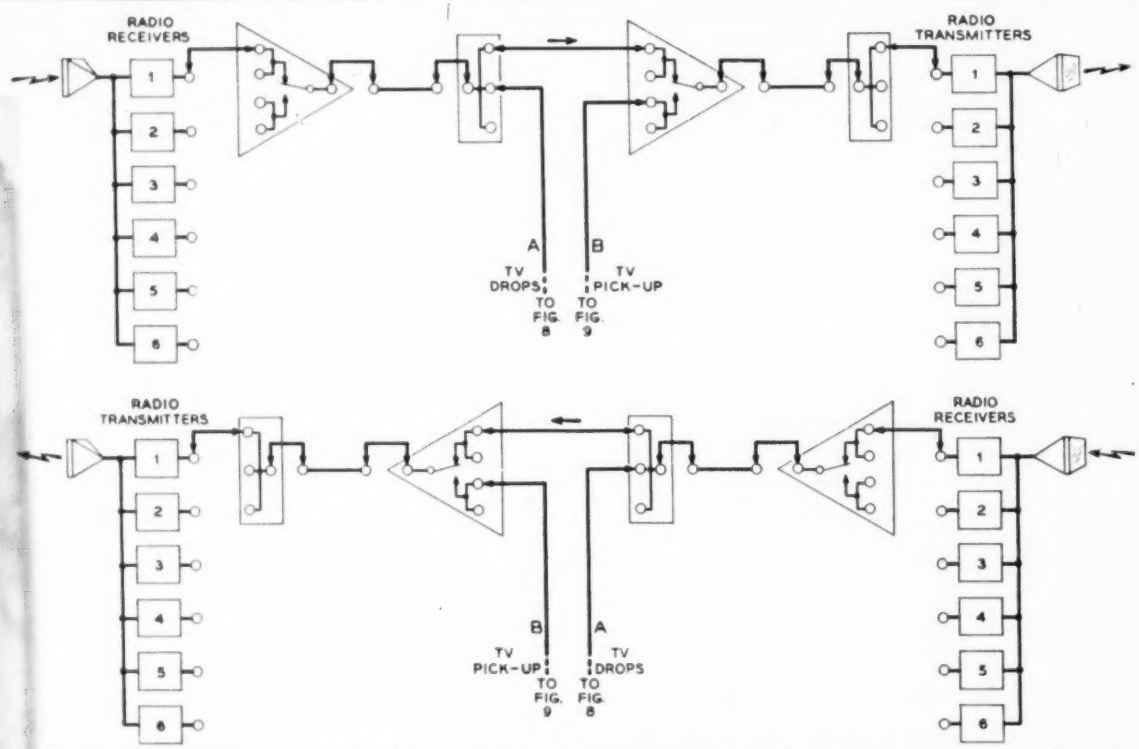



*Fig. 7—Functional arrangement of amplifiers for both maintenance and program patching for channels carrying television.*

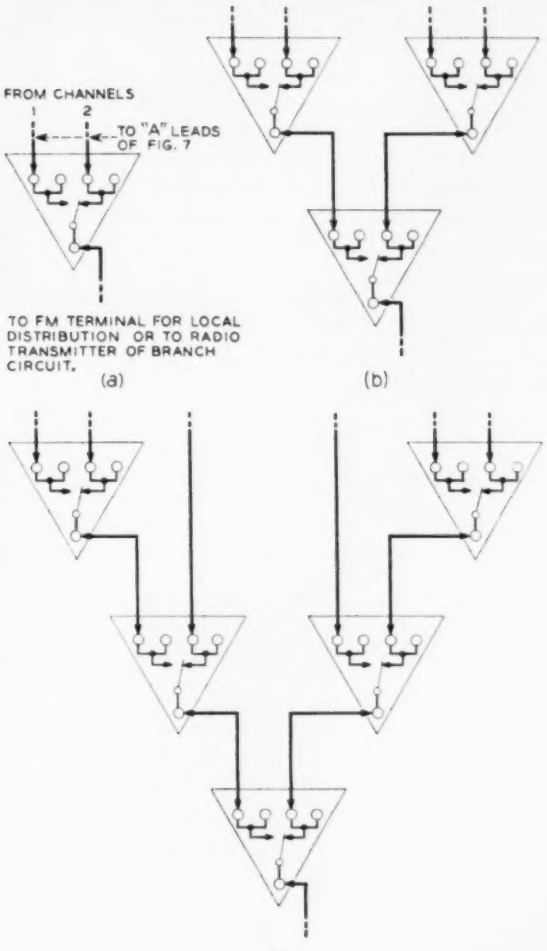



*Fig. 8 – How 2, 4 or 6 television channels can be dropped off to a local station or branching circuit.*

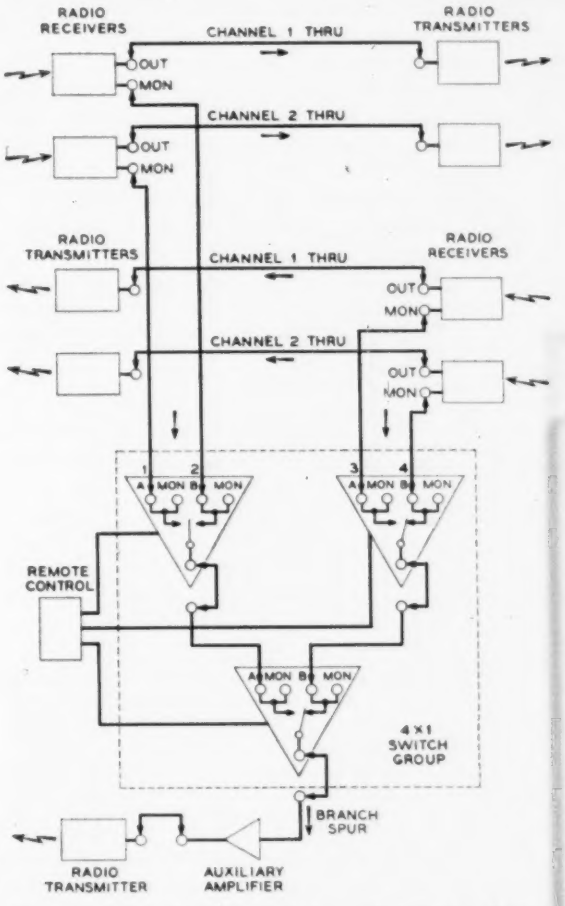



*Fig. 10–Typical arrangement employed for dropping off a television channel at an auxiliary repeater station. Patching is set up permanently, but the switching is carried out by remote control.*

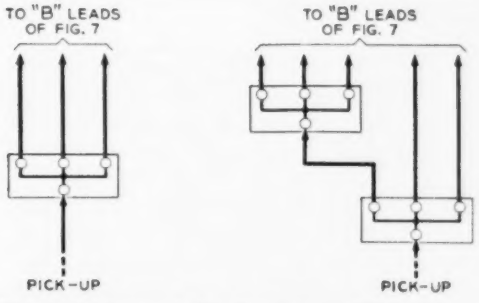



*Fig. 9–Typical use of distributing amplifiers to permit a local television station or a branch circuit to be connected to through television channels.*

minal circuits. Where no terminal equipment is involved, a separate portable oscilloscope is provided. No provision is made at a radio station for monitoring the sound of a television program since the sound is not transmitted with the picture but is carried over paralleling program facilities.

For general over-all maintenance of a radio system, an express radio order circuit is provided which is accessible to all main and terminal stations. For sectional maintenance a local radio order circuit is provided which terminates at adjacent main stations and is accessible to the intervening

auxiliary stations. These order circuits ordinarily use wire line facilities and have appearances in the monitoring bay. Verbal contact between personnel is essential to the performance of maintenance switching since two or more stations are always involved. It is also required for any testing procedures involving more than isolated equipment units of a single station.

Due to the great variety of switching arrangements possible, maximum flexibility has been engineered into the patching arrangements, which will allow the customer to order practically any switching combination he may desire.

Experience with this manual switching system has shown that it facilitates emergency and maintenance switching and provides the flexibility necessary to meet the changing requirements of network distribution. However, short interval circuit outage time may be experienced in event of equipment failure or during periods when fading may occur. To minimize this outage time, there is now under development a completely automatic switching system to monitor the various channels and to substitute a spare channel for any channel where the transmission falls below a preestablished standard.

**THE AUTHOR:** JOHN A. WORD has charge of a group engaged in the design and development of microwave radio relay equipment. Since coming to the Laboratories in 1930, after graduating from the University of California with a B.S. degree, he has been concerned with engineering of trial installations for toll and radio, and design of toll transmission equipment. During World War II he was engaged in the design of sonar, air-borne counter measures equipment, and pulse modulation radio relay equipment.

## *I.R.E. Honors Bell Laboratories Men*

Several Bell Laboratories engineers and scientists were honored by the I.R.E. during the 1952 National Convention of the Institute held last month in New York City.

W. Shockley received the Morris Liebmann Memorial Prize in recognition of his contribution to the creation and development of the transistor. This is awarded to an I.R.E. member for important contributions to the radio art during the preceding year.

Awards of Fellow were made to the following: H. W. Bode, in recognition of his contributions in the field of high frequency and microwave propagation; W. E. Kock, for his contributions in the field of electromagnetic-wave lenses, and antennas; W. W. Mumford, his contributions in the field of high frequency propagation in the development of microwave components; Harry Nyquist, his fundamental contributions to physical and mathematical sciences in communications; and P. H. Smith, the development of antennas and graphical analysis of transmission line characteristics.

# *Cable Sheath Repairs*

**D. T. SHARPE**
***Cable Methods***

Over a quarter of a million miles of cable form the network which connects Bell System telephones to their nearest central office. Most of this cable is above ground and is small in size; it is the cable you see along country roads, or village streets, or attached to the walls of city buildings. On most of this cable, a lead sheath protects the conductors. It acts as an electrostatic shield against noise, and it is also a raincoat to keep insulation dry. Maintenance of the exchange cable plant may be likened to maintaining the integrity of 250,000 miles of thin-walled, lead pipe mainly aerial, into which water must not leak.

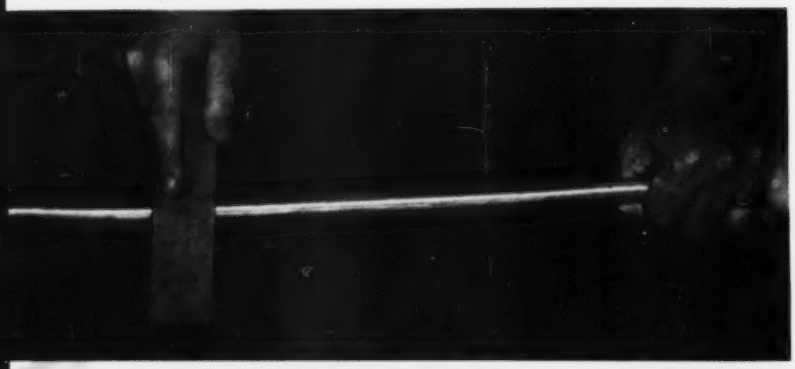
Enough things happen to cables to produce sheath troubles at the rate of about one opening per sheath mile per year, resulting in annual maintenance repair costs to the Bell System of many millions of dollars. Lead fatigue, corrosion, accidents and mischievous shooting are some of the factors which damage the sheath. In some sections of the country small wood-boring beetles industriously drill neat round holes in it, and for some reasons as yet unexplained, squirrels find lead sheath so attractive that they gnaw half a million dollars' worth of unwanted openings in it a year.

In the Laboratories there is a continuing program of assistance to the Operating Companies, through devising better ways of plugging up holes that appear in the cable plant. In many cases of sheath damage, moisture actually may have entered the cable and destroyed the value of the insulation; and if the cause was a bullet, for example, some of the conductors may have been severed or otherwise injured. Repairs of those defects are somewhat complicated because the cable core must be made accessible to permit separate wires to be restored and re-insulated. The common method of doing this requires the removal of a length of the lead sheath and, after the core repairs have been made, the wiping-on of a lead sleeve to replace the removed sheath—an operation that, while effective, is costly and requires the same two-man splicing crew that is used on larger jobs.

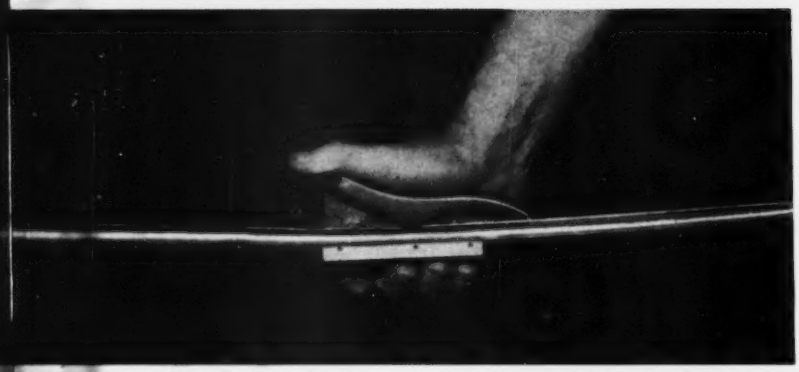
Improvements in methods of handling lead-sheath repair problems have been part of the maintenance betterment program and one such repair technique which has been particularly efficient in reducing distribution cable maintenance costs is usually termed the "slit-sheath" method. It involves slitting the lead sheath, spreading it so that the core of conductors can be bent outward through the opening for accessibility, drying any wet insulation and repairing damaged conductors, re-forming the sheath around the core and, finally, closing the sheath by means of solder applied with an acetylene torch. As standardized for field use, the method consists of the operations illustrated.

Originally this newer method was particularly attractive in those operating areas of sparse population where the cable plant is not great in total quantity but is widely dispersed. In some sections of the country, for example, such cable may be given day-to-day maintenance attention by a repairman who is a telephone Jack-of-all-trades but who may lack the mastery of the art of wiping solder joints possessed by a full-time cable splicer working daily with lead cable. The slit-sheath method is quite useful to the general purpose repairman for minor sheath repairs.

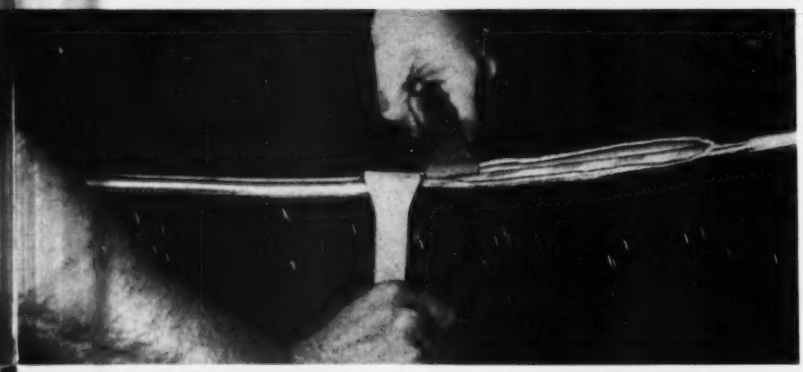
Recent improvements in the tools and techniques have now made the method economically attractive even in densely



*Cleaning lead sheath preparatory to use of the cable sheath slitter is essential to the final soldering operation.*



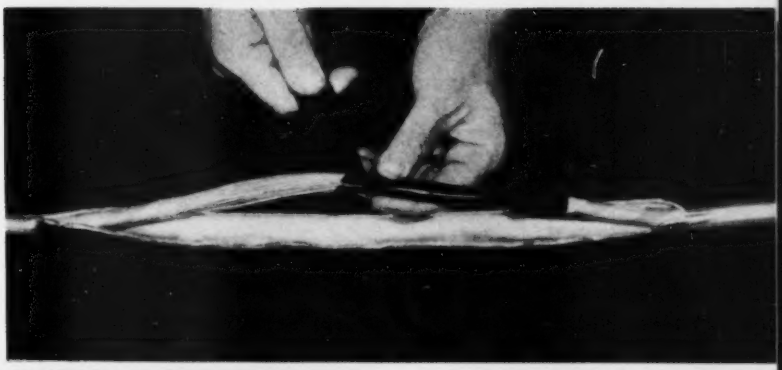
*By means of the cable sheath slitter an incision of the required length is made in the sheath.*



*Tools used to open the sheath wider to permit work on a defective portion of the cable core.*

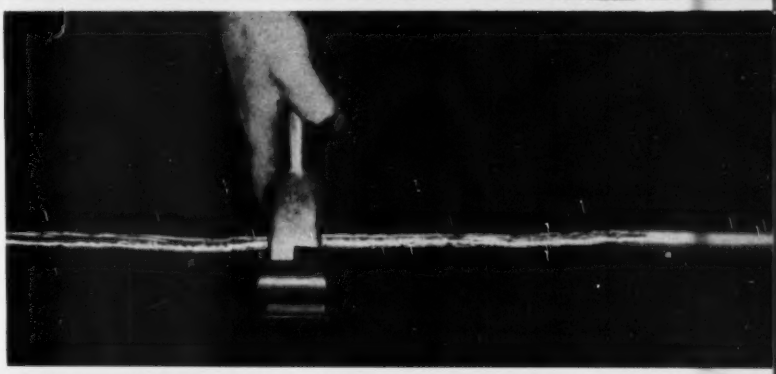
*Insulation is repaired with tape and, at this stage, any wet spots dried and necessary conductor repairs made.*

*Varnished cambric tightly binds the core so as to reduce the core diameter.*

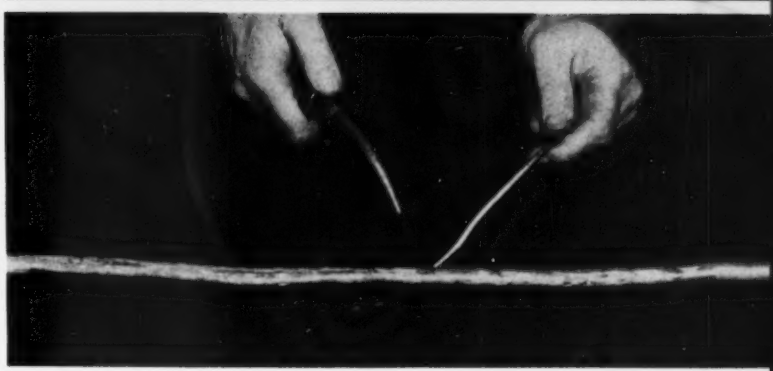


*A strip of lead serving-tape is inserted in the opening to give a base for solder and also to re-enforce the cable at the repair line.*

*Closure of the sheath around the core restores as closely as possible the original contour of the cable.*



*The cable is sealed against the weather and the repair operation is completed by soldering the opening using an acetylene torch.*



populated areas where cable work is performed by a large force of specialists in lead sheath work. In these areas it has been shown by field trial that an over-all reduction in the average number of hours per cable trouble has been effected to speed service restoration and reduce maintenance costs.

One of the tool improvements which has helped to make the slit-sheath method expeditious is the acetylene torch. Considerable savings have resulted from its use and torch soldering in aerial plant* is now about as well established as the older methods of wiping joints or soldering with a tinsmith's copper. The cable slitting tool which is used to make the long incision in the sheath, and the tools used to open the sheath and to reform it around the repaired core have been improved so that relatively inexperienced workmen can readily learn the techniques involved in their operation. Varnished cambric in strip form makes it possible to wrap the core down tightly and without excessive bulk so it may be enclosed in the sheath. A strip of lead serving-tape inserted under the sheath opening simplifies the soldering operation and gives a strong seam because the solder fuses to this strip as well as to the sides of the slit in the lead sheath.

Sometimes it is not convenient to use the slit-sheath method. Bends in the cable or an interfering sleeve may form obstacles that hinder the operations of opening and closing a sheath. Again, if the sheath damage is extensive it is considered more economical to remove the damaged section and replace it with a lead sleeve. In such cases the "small sleeve" method, in which the removed section of sheath is replaced with the smallest size of lead sleeve which will fit over the tightly wrapped core, has been used with considerable success. In this latter method the repairs to the conductors, the wrapping of the core and other operations are similar to those used in the slit-sheath method; the significant difference is the use of a lead sleeve which is split longitudinally and opened for placing over the core. The ends of the sleeve are then beaten in around the cable and soldered to the sheath and the longitudinal opening is closed by means of a soldered seam. This sleeve is similar to the sleeve used in the conventional wiped joint method of cable repairs but since the conductors are wrapped down tightly a small sleeve can be used and most of the advantages of the slit-sheath method are retained.

Together these two methods have proved useful additions to the many techniques employed in maintaining service over Bell System cables. Records kept in the experimental trials at Morristown have shown that substantial savings in repair time can be effected, and that these prompt repairs offer an additional safeguard to continuity of service to Bell System patrons.

*The use of open flames is not permitted in manholes.

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**THE AUTHOR:** After two years at Iowa State College, D. T. SHARPE entered the U. S. Steel Corporation, Engineering Department, in 1924. Here he was concerned principally with fuel economy studies, but also took a two-year metallurgical course. Coming to the Laboratories in 1928, he became a member of Outside Plant Development, becoming concerned with problems relating to cable splicing and maintenance. Since World War II, he has been active in splicing studies in connection with the development of new types of cable sheaths and on improvements in gas pressure testing methods.

# The 108A Protector

Rapidly extending rural telephone service since the war has raised many new problems and intensified others. Many of these rural lines run on the same poles as power circuits of over 5000 volts. As a result voltages higher than normally encountered may be induced on the telephone lines through the capacitance between the power and telephone wires. As long as the telephone lines are connected through to a central office, the drainage afforded by the relatively low impedance to ground will hold down these voltages. When in the course of maintenance work the connection to the low-impedance ground is opened, however, the induced voltage on the isolated section of telephone line might become high enough to be objectionable if remedial measures were not taken. Heretofore, these have taken the form of the 104A protector, shown schematically in Figure 1.

If spaced about three miles apart, these 104A units provide adequate drainage, but on the longer joint-use lines that have recently been coming into use, the shunting impedance of the increased number of protectors becomes low enough to effect ringing and speech transmission. As a result, a new protector, the 108A, was developed under the direction of P. A. Jeanne for use on these longer lines.

In this newer protector shown at the right in Figure 1, the resistances of the 104A unit are replaced by an inductance coil, with a second coil in the ground connection. The inductors and capacitors are tuned to 60 cycles, and thus present a low impedance to ground for power-line frequency but high impedance at voice and ringing frequencies. In Figure 2 one of these units is shown mounted in the housing designed by the Outside Plant Development Department.

*Fig. 1–Circuit of the 104A protector, at the left, and for the 108A protector, at the right. The lightning protection has been omitted for simplicity.*

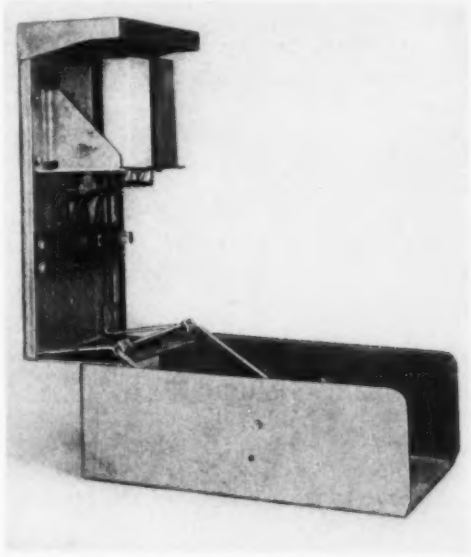


*Fig. 2–The 108A protector in its mounting.*

# *Key West-Havana Cable—*
## *The Power Plant*

**H. H. SPENCER**
***Power Plant Development***

Design of the power plant for the Key West-Havana submarine cable was influenced by a number of new and special requirements. Maintenance of constant current and voltage for the electron tubes, essential if they are to have a long life, made it necessary to engineer the power plant with unusual emphasis on regulation, continuity of service, and protection against excessive current on sudden surges or interruptions.

To insure proper current at each repeater and to avoid the need for power packs in the repeaters, they are energized by direct current supplied over the central conductor of each cable from the Key West end. A current of 230 milliamperes supplies 4 watts to each tube cathode heater, and the voltage drop across the tubes furnishes the plate, screen grid and control grid potentials. The cable transmitting toward Havana (cable No. 5) is supplied from a source of negative potential to ground, while the other cable, No. 6, is connected to a positive source. The energizing path is connected to ground at the Havana end, but since the currents in the two cables are held at practically the same value, no un-

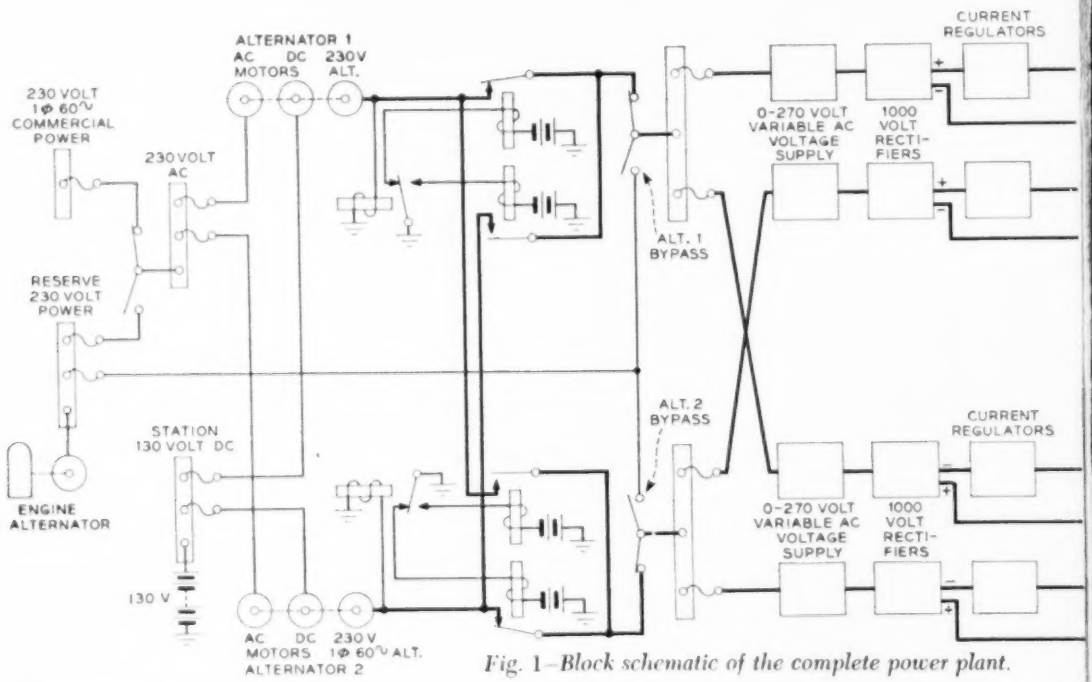


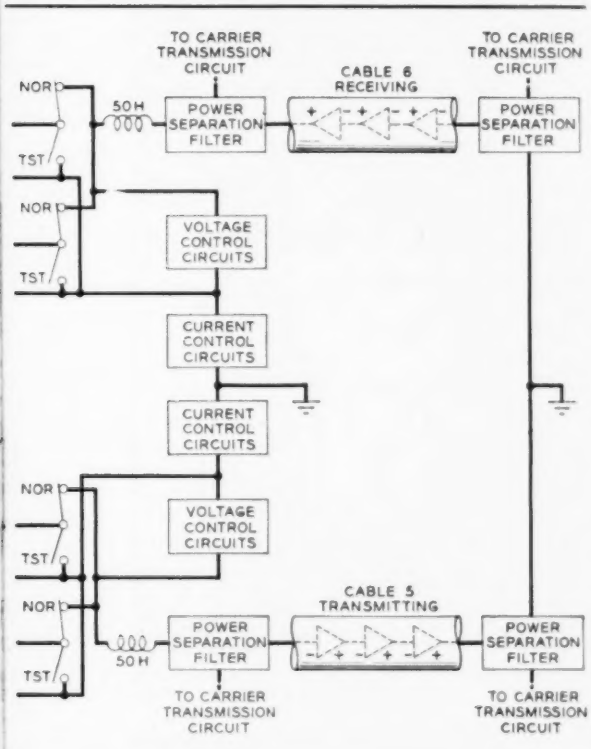

*Fig. 1—Block schematic of the complete power plant.*

balance ground current will normally flow even with varying earth potentials. In fact, the presence of unbalance current at the Havana end and not at Key West, will indicate abnormal current leakage.

A block schematic of the complete power system is shown in Figure 1. For reliability, two separate ac supplies are provided, using two motor alternator sets operating from a commercial 230-volt, single-phase, 60-cycle source. If one of the sets should fail, the load is automatically transferred to the other and if the commercial power supply fails, directly coupled d-c motors automatically take over driving the alternators. An additional emergency power source for the system is provided in the form of an engine driven alternator.

As indicated in Figure 1, the total cable current flows into the cable through a 50-henry inductor and power separation filter. The 50-henry coil protects the cable elements from a too rapid buildup of current during switching or under trouble conditions in the power supply. The power separation filter separates the carrier frequency transmission from the power supply. Common control circuits are provided, including cable voltage and current alarms, meters for reading current and voltage, as well as unbalance current, over-voltage, and current protection. Alarms are given for ± 2 per cent changes from the normal regulated current value, and voltage alarms for about ± 5 per cent. These circuits are connected in such a way as to drive the power supply voltage to a lower value which would result in a safe current through the cables. When this happens, a major alarm is given, requiring attendance of the maintenance force to correct the trouble.


*Fig. 2—Dc regulating and common control bays.*



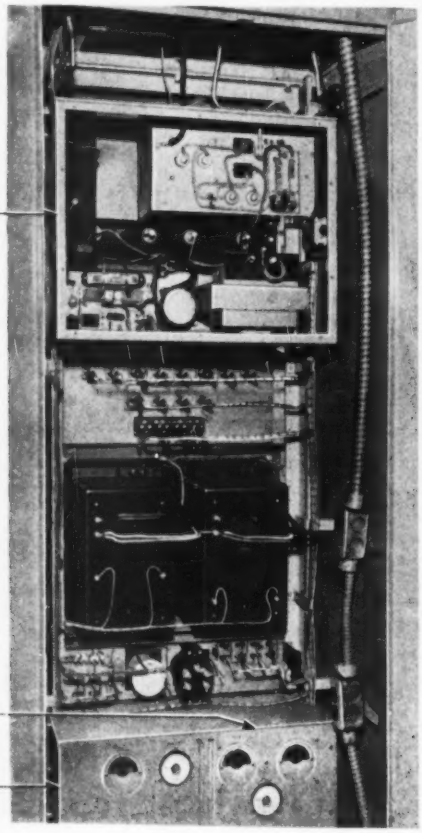

The common control bay and the parallel regulating bays at either side is shown in Figure 2. The meters in the upper part of the common bay indicate the power supply voltage and current to the cable. The small round meter just above the operator's finger is the ground current unbalance meter. Recording meters in the next lower panel provide a continuous record of current and voltage. Lamps on the panels indicate abnormal conditions of voltage and current, and of

any compartments that might be opened. In addition to circuit safeguards to give the utmost reliability of power supply, the equipment was designed to protect against loss of service through accidental operation of the controls. Most important of these features is the use of a key locking system to prevent switching both regulator bays off the cable at the same time. A single key, A, is provided for unlocking either of the regulator bay test switches. This key as indicated in Figure 2, has been used to remove regulator No. 2 from cable service; it is now held captive and cannot be removed and used to unlock the switch in regulator No. 1.

Protection of personnel against dangerous voltages is also accomplished by the key locking system. For example, to enter the current regulator test compartment in regulator Bay 1, key A must be removed from Bay 2, inserted in LOCK A, and turned to permit operating the upper right-hand switch in Bay 1 to TEST. Key B must then be turned to lock the switch in this position before it can be removed and used in the lock BD in the ac control unit below. Here key B can be turned only if the variable transformer is adjusted to provide a safe test voltage. Turning key B then locks the variable transformer and frees key D which can be removed to unlock and open the test compartment cover in the lower part of the regulator unit. Key D is held captive while the cover is open, to prevent "back tracking" on the locking system. Similar

*Fig. 3—Rear view of common control bay with doors open and cover of high voltage compartment (at the top) removed.*

*Fig. 4—Rear view of common control bay, showing the high voltage test compartment door open for maintenance.*



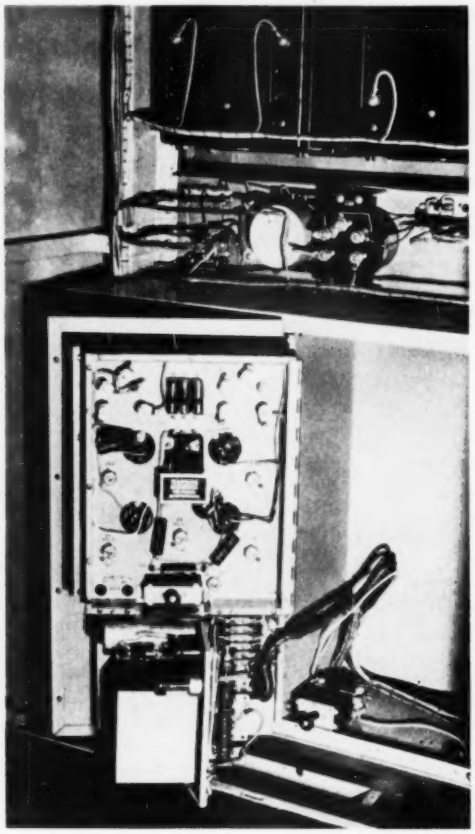



*Fig. 5–The two motor alternator sets with the dc motor starters and motor controls.*

locking arrangements are also provided requiring power to be removed before opening front or rear equipment compartments in the regulating bays.

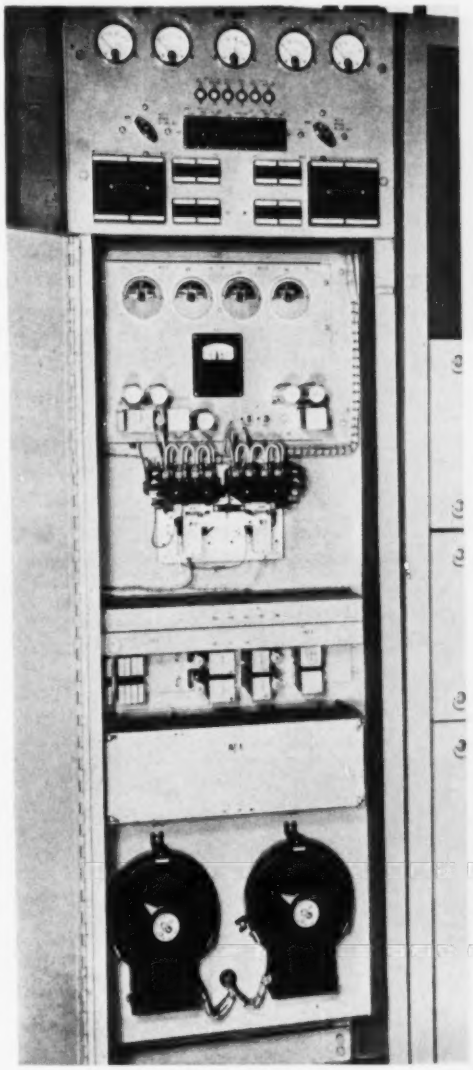
A high voltage compartment within the common control bay is shown in Figure 3. Added protection is obtained by using a separate screw-on cover for this compartment.

At the bottom of Figure 3 are the current and voltage control relays, enclosed in compartments designated the "turndown" compartments, because the relays operate to drive the variable transformer to prevent excessive current from flowing in the cables. Separate compartments permit working on one at a time so that the other can provide overload cable protection at that time. Figure 4 shows the high voltage turndown compartment open for maintenance. A Plexiglas door on the inner compartment may be opened for access to the part of the circuit connected to the ungrounded side of the cable and includes a cover switch to open this connection to protect personnel and cable service when the door is opened.

The two alternators, each provided with DC motor starters in the cabinets underneath, are shown in Figure 5. The alternators are first started on dc, and when the voltage builds up to its normal value, relays operate to transfer the driving power to ac induction motors. These relays also automatically transfer the driving power back to battery in case of failure of the commercial power source. Each alternator normally supplies two regulating bays, each delivering half of the direct current for each of the two cables. In case of failure of one alternator, its load is switched automatically to the other. A view of the common control bay, with the front door opened, is shown in Figure 6.

These alternators are the same as those used in L1 carrier terminal stations to supply power to coaxial repeaters. The con-

*Fig. 6–The ac alternator control bay with front door open.*



trol circuit is similar to that used in L1 carrier, the chief difference being in the arrangement of either set to act as a standby for the other, whereas in L1 applications, one set carries its normal load and transfers to an emergency set normally running at no load.

As mentioned previously, unusual emphasis has been placed on maintaining continuity of service and security. The principal components have been furnished in duplicate and conservatively rated apparatus used throughout. In the case of the ac power supply, the induction motor-driven alternators cushion sudden power surges by the inertia of their rotating parts, and the provision of the dc coupled motor will assure smooth continuity under power failure. Switching has been kept to a minimum and is nearly all done on a manual basis with interlocks to prevent accidental opening of the cable current.

A recent addition (made last month), to provide further reliability of the power supply has been that of a dry battery in parallel with the common cable supply at a point immediately ahead of the 50-henry inductor. This battery is normally on open circuit, and is applied only when the cable current remains below 95 per cent of the regulated value for periods exceeding 5 seconds. A thermal timer determines when the battery is connected into the circuit. Duplicate batteries and controls are provided for each polarity, giving a reserve capacity of about 4 hours in the event of a complete failure of the regular power. This should give sufficient time to enable the maintenance force to correct the trouble.

Use of the battery insures that the current through the electron tubes within the repeaters will not be interrupted long enough at any time to affect the tube life, an essential factor for the exceptionally long life requirement of the underwater repeaters.

**THE AUTHOR:** H. H. SPENCER graduated from the Univerity of New Hampshire in 1923 with a B.S. in Mechanical Engineering degree. Coming immediately to the Laboratories, he spent three years on analyzation of power supplies for manual, toll, and repeater offices; this was followed by standardization of power plants for telegraph, repeater, broad band carrier, and radio systems. Included in these are the 60-cycle power supply for the type-L carrier coaxial repeater, the automatically operated plants for unattended repeater stations having commercial power available, such as those for J and K carrier, and similar plants using automatically controlled engine generators as prime sources of power. He is presently supervising a group engaged in power plant development for telephone and military applications.

# *New Longitudinal Tape Shield for Video Pair Cable*

**A. S. WINDELER**
***Outside Plant Development***

The shielded video pair* used in cables for television pickup connections is insulated with polyethylene strip and string. It has been satisfactory in most respects, but in some cases inadequate shielding against noise has limited the length of the repeater sections. To increase the shielding it has been found necessary to apply one of the shielding tapes in a different manner.

In the former design shielding was provided by two copper tapes both helically-wrapped. The double tape shield was more effective than a single helical tape. However, even with the double helical tape the longitudinal shielding (that against noise and crosstalk currents set up on the outer surface) has the property of becoming poorer with an increase in frequency, and thus it was inadequate for the longer repeater spacings. In the new design a longitudinal-seam copper tube is substituted for the inner helical copper tape.

The construction of this new type of video pair is shown in Figure 1. The resulting improvement in longitudinal shielding has been outstanding. Figure 2 shows the relative longitudinal shielding for the double helical copper shield and for the shield that has the longitudinal inner copper tape.

A simplified explanation of the superiority of the longitudinal tape shield begins with the fact that interference produces a current on the external surface of the shield. This induces a voltage on the inner surface, which in turn is coupled electrostatically to the video pair. The ratio of the voltage to the current is called the surface transfer impedance, designated $Z_{a\beta}$. But $Z_{a\beta} = 2Z_{aa}e^{-h}$ where h is the "electrical

* RECORD, *May*, 1948, *page* 201.

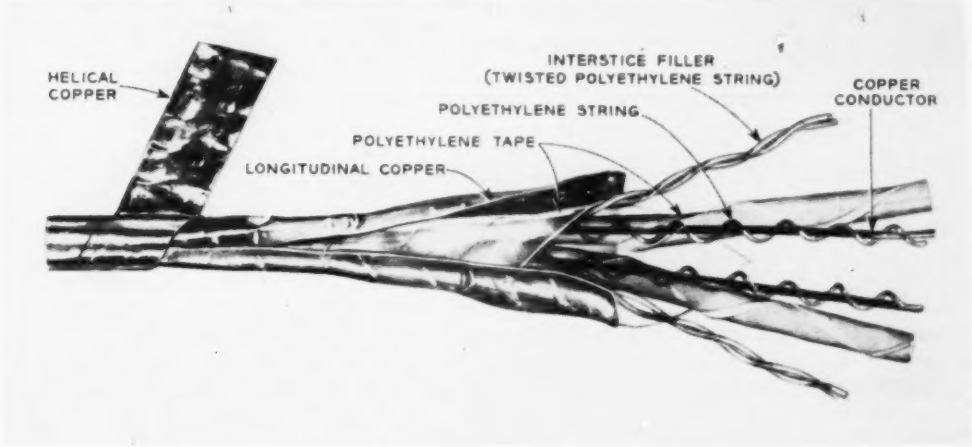



*Fig. 1—Construction details of the various elements, including the longitudinal inner copper shield now incorporated in the standard video pair.*

thickness" of the shield and $Z_{aa}$ is the surface self-impedance considered as one side of a coaxial circuit.

It is obvious that an attack on $Z_{a\beta}$ can be made by reducing $Z_{aa}$. In other words, the lower the longitudinal resistance of the shield, the better it will function. At low frequencies, the current will follow the spiral shield well enough, but at the higher frequencies, the spiral path will rapidly increase in impedance, so that most of the high frequency noise current flows across the contact resistance between adjacent turns. By making one layer of the shield a longitudinal tape, a large improvement in shielding is effected and the allowable repeater section is increased from 4 to 6.6 miles.

In addition to the outstanding improvement in shielding, there is a small but worthwhile reduction in attenuation with the new shield. At the frequency of 4 mc, which is the highest used in the present video system, the attenuation of the video pairs with the old shield is 18 db per mile while that of the video pair with the new shield is 17 db. If future video transmission systems require the use of higher frequencies on video pairs, the advantages of the new shield will be found to be even more pronounced.

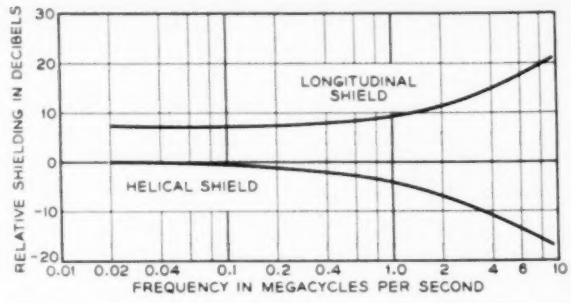



*Fig. 2—Improvement in the relative longitudinal shielding gained by using the longitudinal inner shield in the video pair.*

**THE AUTHOR:** A. S. WINDELER was graduated from Rutgers University in 1930 with a B.S. degree and joined the Laboratories Technical Staff the same year. As a member of the Outside Plant Development Department, he engaged in cable development work at Kearny for a brief period before being transferred to Point Breeze to carry on with the same type of work. Among the developments with which he has been associated are type K carrier cable, coaxial cable, and video-pair cable. During the war, Mr. Windeler was concerned with the design and standardization of microwave cables.

## *"Father of Radio" to be Honored*

On the evening of April 8, a testimonial dinner will be given at the Waldorf-Astoria in honor of Dr. Lee deForest in recognition of his basic invention of the three-element vacuum tube which plays such an enormous part in the communication industry. Former President Herbert Hoover will be the principal speaker. In addition, former Governor Charles Edison and, of course, Dr. deForest will speak. During the dinner, a bust of Dr. deForest will be presented to Yale University, of which he is a graduate. Irving S. Olds, Chairman of the United States Steel Corporation and a fellow of the Yale Corporation, will accept the bust on behalf of the University.

Besides many of Dr. deForest's old friends and associates, it is expected that representatives of communication industries, radio and television manufacturers, broadcast company representatives, and scientists will gather to honor Dr. deForest.

# *Central Office Equipment for AMA*

**P. W. SHEATSLEY**
***Switching Systems Development***

Automatic message accounting equipment in a central office comprises seven major units. These, with their interconnections, are indicated in solid lines in Figure 1. AMA equipment is available for both No. 1 and No. 5 crossbar offices, and except for the transverter and the transverter connector, these major units are the same in both types of offices. The frame constructions, however, are different for the two types of offices, and the association of the AMA equipment with the central office circuits also differs. In No. 1 crossbar offices the association is with district junctors and subscriber senders, while in No. 5 offices it is with outgoing trunks and outgoing senders.

For the AMA circuits in a central office, the transverter° performs a common control function much as the marker does in the central office switching system. It is brought in on all AMA calls by the sender acting through a transverter connector, the number of transverters being dependent on the amount of message rate and subscriber-dialed toll traffic. Usually there are not less than three transverters, with a maximum of five in No. 5 offices and eight in No. 1 offices. Each transverter has access to all the recorders, and to all the translator frames.†

Each recorder has a perforator‡ and a call identity indexer directly associated with it, there being one such group for each 100 trunks in a No. 5 office, and for each district junctor frame of 100 district junctors in a No. 1 office. The outgoing trunks in the No. 5 system appear on the trunk link frames, which makes it possible to limit the AMA equipment to particular trunk groups having sender access and arranged for message rate traffic. The major portion of the flat rate traffic is routed over other trunk groups not equipped with AMA recorders. In No. 1 offices, the district junctors appear directly on the line link frames, where it generally is not feasible to segregate the message rate traffic. All non-coin district junctors therefore must be arranged for AMA, and this is done by assigning a call identity indexer, recorder and perforator to each district frame. The No. 1 crossbar system being arranged for 20 district frames may have 20 regular recorders supplemented by an emergency recorder. In the No. 5 system, the maximum provided for is ten regular recorders and an emergency recorder.

In a No. 5 crossbar office, the call identity indexers and recorders mount on two-bay frames called recorder frames, Figure 3. The equipment for these two circuits is assembled in shop-wired and

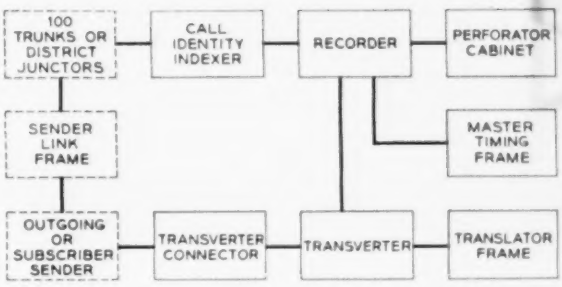



*Fig. 1—Seven major equipment units, indicated by solid lines above, comprise the AMA equipment in a central office.*

° RECORD, *December*, 1951, *page* 565. † *February*, 1951, *page* 62. ‡ *November*, 1951, *page* 504.

shop-tested units, the recorder unit extending across both bays of the frame, and the call identity indexer unit across one bay. Two call identity indexer units thus occupy the space of a recorder unit. The initial frame in an office is equipped with three recorder units, emergency and two regular, and with two call identity indexers associated with the two regular recorders.

The perforators for the recorders are mounted in a steel cabinet, two in each cabinet, along with a supply of paper tape and facilities for storing the perforated tape output. The paper tape is supplied in folded form rather than on reels or spools so that there will always be a continuous supply available to the perforators. This is done by storing the folded paper in two bins placed one above the other, each containing 3,000 feet of tape. By splicing the bottom end of the tape in the top bin to the top end of the tape in the bottom bin, there is available to each perforator a total of 6,000 feet of tape. When the supply in the top bin is exhausted and while there is still paper in the bottom bin, the latter is moved to the top position, and a fresh carton of paper is added in the second bin. This bin is then placed in the lower position and the two lengths of paper spliced together. The output from the perforators is stored on reels that are rotated automatically by motors as slack develops with the operation of the perforators. Figure 2 shows a central office cabinet enclosing two perforators in the upper portion behind a clear plastic cover. Below the perforators on either side of the cabinet are the paper input bins, and between them are the motor-driven reels for storing the output tape from the perforators.

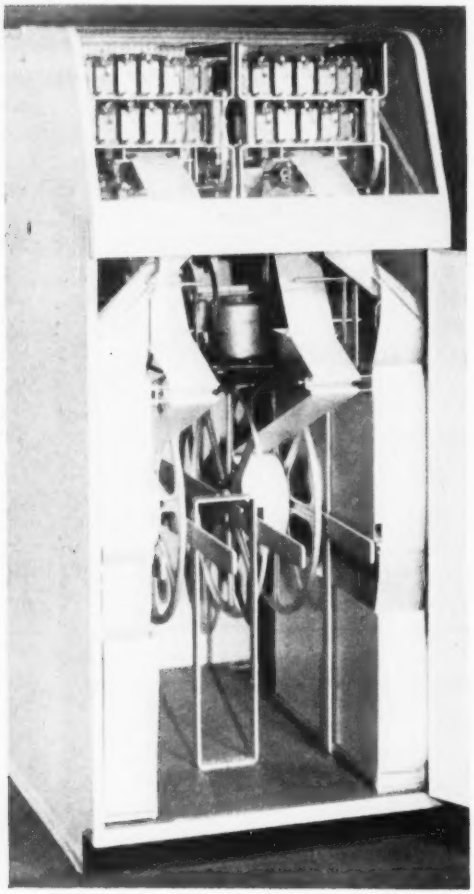


*Fig. 2–A perforator cabinet houses two perforators and their tape supplies. Below the perforators on either side are the paper input bins, and between them are the motor-driven reels for storing the output tape from the perforators.*

The transverter circuit occupies the frame shown in Figure 4. Besides the register, check, progress, and recorder start relays comprising the basic part of the circuit, there are facilities that enable the transverter to connect with a particular translator frame and terminal on that frame, as determined by the calling subscriber's line location number. A cross-connecting field in the lower portion of the frame provides flexibility in the assignment of the translator frames to the lines as they appear on the line link frames. A minimum size group of three transverters is usually furnished so as to provide for maintenance and trouble conditions.

The transverter connector frame provides connecting paths over which the AMA information registered in the outgoing senders is transferred to the transverters. Each connecting path, called a transverter connector, is common to five senders in a No. 5 office. There are three connectors on each frame, thus providing transverter access for a maximum of 15 senders.

*Fig. 3 (left)—A recorder frame in a No. 5 crossbar office in Englewood, N. J. Three recorders occupy the upper three quarters of both bays of the frame, while two call identity indexers are at the bottom of the frame—one call identity indexer in each bay. Fig. 4(center)—Three transverter frames in the No. 1 crossbar office at Hackensack, N. J. Fig. 5 (right)—The master timer frame at the left and the transverter trouble indicator frame on the right in the No. 1 crossbar office at Hackensack.*

A single master timing frame* shown in Figure 5 serves all the recorders associated with a transverter group. Each frame includes two master timing circuits, designated even and odd, either one of which may be used to supply six-second pulses to the recorders and perform other functions such as periodically checking their timing circuits for synchronization, causing a time entry to be placed on the tape of each recorder at the turn of the hour, and controlling the entry of the end of tape pattern. Also included on the frame are transfer facilities between the even and odd timing circuits, and means for testing the recorders in making initial, answer, and disconnect entries. Between the even and odd timing circuits in the lower and mid portions of the frame, respectively, are the two motor-driven timers, also a key, lamp, and jack panel used in making synchronization checks. The upper portion of the frame is occupied by the transfer and recorder test functions.

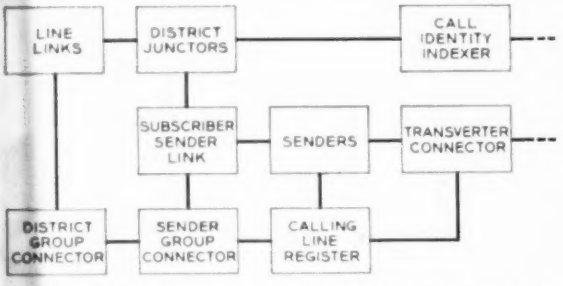



*Fig. 6—Auxiliary equipment in a No. 1 crossbar office to transmit information from the line link frames to the senders.*

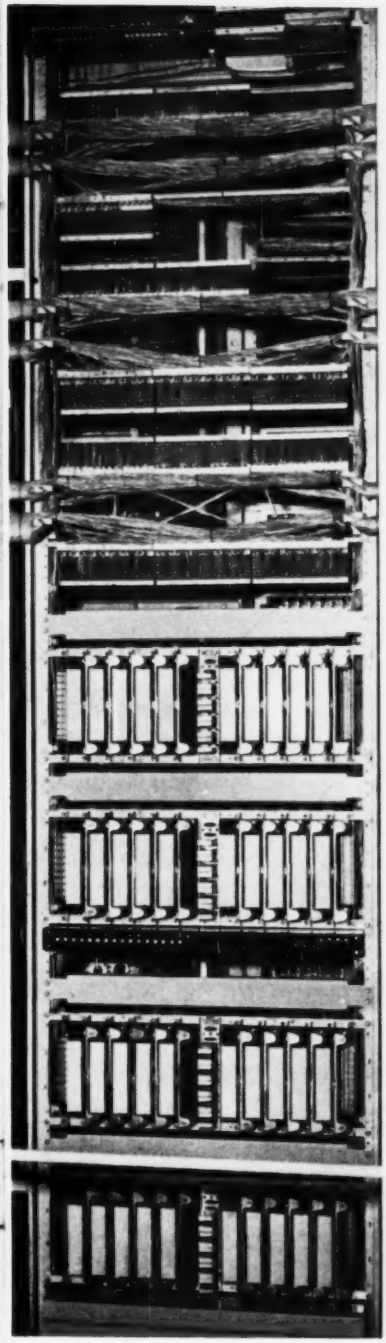
Of the above equipment, the call identity indexer, recorder, translator and master timing circuits are common to both No. 5 and No. 1 crossbar, as already mentioned, but are assembled on sheet-metal frames for No. 5 offices and on bulb-angle frames for No. 1 offices. The transverter is different for the two systems, primarily because of a difference in the translator selection feature, brought about by a difference in the way the subscriber's line is identified in the two systems.

Another frame that is different for the two systems is the transverter connector frame. In No. 5 crossbar, the transverter connector serves five senders and completes a path of 150 leads to the transverter, while in No. 1 crossbar it serves a maximum of ten senders and connects through 120 leads. The difference in sender capacity is brought about by the use of multi-frequency out pulsing senders in No. 5 offices. These have a much shorter holding time than the revertive out pulsing senders used in No. 1 crossbar, which reduces the number of senders that can be accommodated in a single transverter connector.

In No. 5 offices the calling line number is registered in the marker in the normal course of handling a call and accordingly is available to the outgoing senders on AMA calls. In No. 1 offices arranged for AMA, on the other hand, auxiliary equipment must be added to transmit this information from the line link frames to the senders. This takes the form of a district group connector frame, a sender group connector unit, and a calling line register frame. This arrangement is indicated in Figure 6. From and including the call identity indexer and the transverter connector, the AMA equipment is as shown in Figure 1. Included on the calling line register frame, shown in Figure 8, are 25 relays used for registering the calling line number as received from the line link frame. In the No. 5 system these register relays are mounted with the sender, but in No. 1 offices it is necessary to locate them exterior to the sender. There is one district group connector frame, Figure 7, for each 16 line link frames and a calling line register frame for each 30 subscriber senders. One sender group connector and one call identity indexer is furnished for each district junctor frame. These two units therefore are grouped on a separate frame in No. 1 offices, designated a call identity indexer frame and having a capacity of four district junctor frames. The recorders in No. 1 offices appear on recorder frames, four recorders to a frame.

Supplementing these AMA frames in the No. 1 central office are two maintenance frames: a maintenance recorder frame and a transverter trouble indicator frame. The

* Recorn, *March*, 1952, *page* 122.



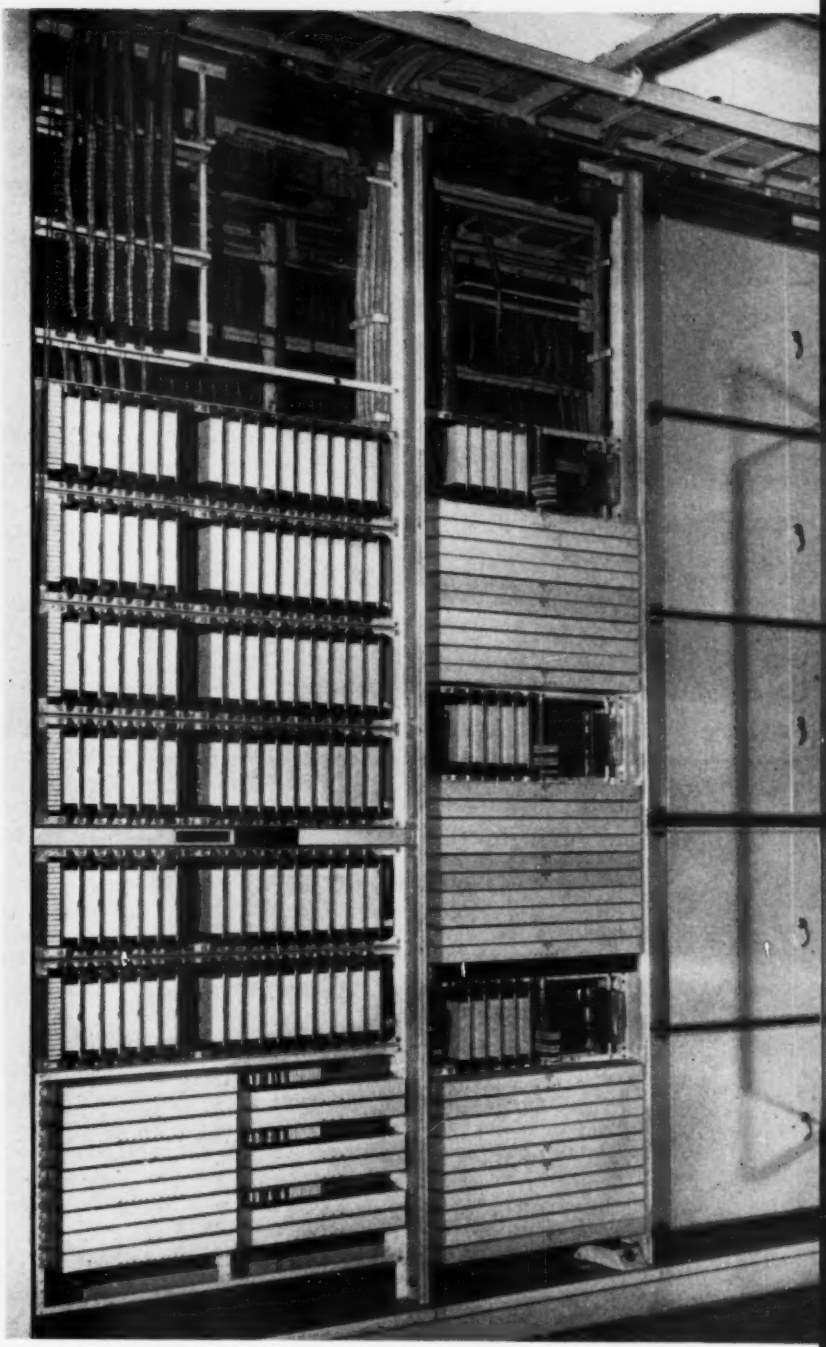


*Fig. 7 (left)—A district group connector frame, which is required only in No. 1 crossbar offices.*

*Fig. 8 (right)—A transverter connector bay at the left, a calling line register bay in the middle, and a bay of senders at the right in the Hackensack office.*

maintenance recorder frame together with a perforator and reader located in the perforator cabinet and a teletype printer located in the maintenance center is used to make a printed record of calls to permanent signal holding trunks, line verification test calls, and sender test calls. The transverter trouble indicator frame, by means of a lamp display, indicates trouble or irregular operation encountered in the transverter, recorder, and master timing circuits. In No. 5 offices the functions of these two frames are performed by the trouble recorder and master test frame.

**THE AUTHOR:** As a member of the switching systems development department, PAUL W. SHEATSLEY has been concerned with the development of central office equipment associated with AMA systems. After his graduation from Ohio State University in 1915 with a B.M.E. degree, he joined the A T & T where he studied various types of switching systems. When his department became a part of the Laboratories in 1934, he was assigned to the study of local crossbar switching systems. Since then his work has been related to this and similar studies.

## *New TV Facilities Planned*

Long Lines has filed an application with the Federal Communications Commission for authority to provide three additional channels for television service between Chicago, Omaha and San Francisco. Upon completion of this project in 1953, there will be five television channels between Chicago and San Francisco—three west from Chicago, and two east from San Francisco.

At present there are two channels for television, one in each direction, between Chicago and San Francisco, and an additional westbound channel in the Chicago-Omaha section. Of the three new channels planned, one will be placed in service late this year and will operate from Chicago to San Francisco. The other two channels will be placed in service in 1953, adding one channel from San Francisco to Chicago and one from Omaha to San Francisco.

Some 6,000 channel miles of radio-relay facilities are involved in the projected addition. The Long Lines television network has grown from 476 channel miles in 1946 to about 24,000 miles today of which 14,000 miles are carried by radio-relay, the remainder by coaxial cable.

Long Lines also has announced that efforts are being made to expedite extension of network television facilities to Miami, New Orleans, Houston, Dallas, Ft. Worth, and Oklahoma City in time for the forthcoming national political conventions.

Originally scheduled for the "last half of 1952" the network additions are being rushed to meet the earlier date. It was emphasized, however, that priority of construction for national defense and possible material shortages make it impracticable at this time to assure the advanced dates.

# Twenty-Five Years of Television Transmission

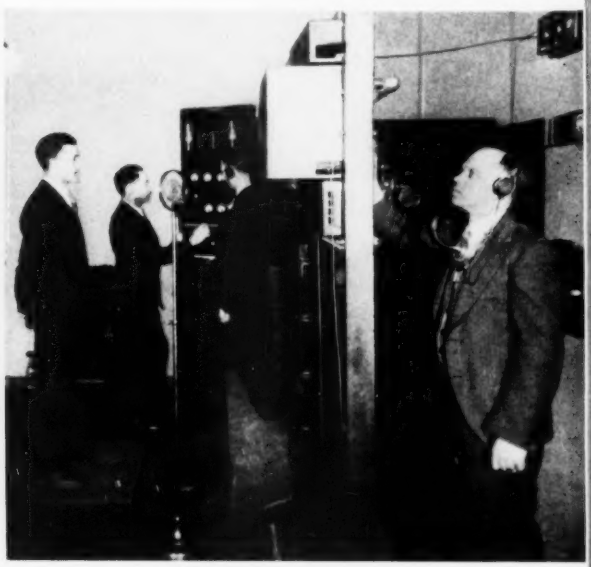
*Herbert Hoover, then Secretary of Commerce, talked from Washington at the first public demonstration of television. With him were, left to right, General J. J. Carty, vice president of A T & T, A. E. Berry, president of the Chesapeake and Potomac Telephone Company, and Judge Stephen Davis, solicitor for the Department of Commerce. Above, left—A 20kc television image as photographed on the viewing screen.*

This month will see the 25th Anniversary of the first transmission of television signals over substantial distances. It was April 7, 1927—and on that day a public demonstration of television was made in the Laboratories' auditorium at West Street. It was not just a showing of images sent across the room, but real long distance transmission from Washington to West Street by wire circuits and from Whippany to West Street by radio. It marked the beginning of a program by which the Bell System now connects 86 television transmitters with their program source, forming a network from Boston to Jacksonville and from New York to Los Angeles. In the quarter-century, the transmitted band has gone up from 20,000 cycles to millions of cycles, and with the improvement in quality the number of receiving sets has gone up from zero to something like 17 million.

In the summer of 1924, the Laboratories and Long Lines had demonstrated still-picture transmission from Cleveland to New York and by January development on a commercial system had been completed. H. E. Ives was the project engineer and he soon was authorized to proceed with a program looking toward television. A preliminary survey revealed that a head-and-shoulders picture, in sufficient detail to be recognizable, and scanned fifteen times a second, could be provided by a frequency band which could be sent over open-wire lines. In other words, it seemed that the job could be done. Evidently Dr. Ives was the man to head the work, since the most difficult problems concerned the terminals and were amenable to laboratory attack. These problems were broadly, securing the necessary light-sensitivity in the pickup apparatus, producing enough modulated light to make the received image visible, and synchronizing the transmitting and receiving apparatus.

*With Mr. Gifford (center) while he talked with Herbert Hoover in Washington were E. P. Clifford, Vice-president; H. D. Arnold, Director of Research; E. B. Craft, Executive Vice-president; Frank B. Jewett, President; Herbert E. Ives; and Frank Gray. Of the group only Dr. Gray is now in active service.*

In March of the following year (1926), executives of the Laboratories saw recognizable faces transmitted from one room to another, using Frank Gray's beam scanning method.* This might have been the subject of a public announcement, but in Dr. Ives' own words: "From the beginning it had been considered a necessary part of our obligation as an enterprise engaged in the transmission of information over great distances, to produce for vision a close parallel to what had been done for voice. It would be television when the laboratory experiment was expanded to cover distances beyond any the eye could reach."† Accordingly, transmission requirements as to band width, flatness and phase shift were worked out and a group was activated in A T & T under A. B. Clark for the wire line from Washington. A similar group at Whippany under E. L. Nelson took up the radio problem.



*Left—In Washington control room, C. R. Keith monitored the order wire and voice circuits while George Knapp regulated the television system. Right—Studio and control at Whippany.*

Transmission questions of importance over open wires are attenuation and its variation with frequency; phase shift; echoes from impedance irregularities; noise; the effect of wet weather on insulation; and crosstalk. Satisfactory solutions were found for these difficulties to the extent that they appeared in the line available—regular and spare circuits of 165 mil copper running from Washington via Newtown Square, Pa., and Newfoundland, N. J., to the river crossing at the Passaic River and thence by 13 gauge carrier-loaded cable through the Long Lines testboard and to West Street. In all, there were 285 miles of open wire and 8 miles of cable in the picture circuit, which was set up to transmit a band from 10 cycles to 20,000 cycles. Carrier transmission was considered, but the decision was to transmit what we now call the video signal. The program, synchronizing and order circuits were transmitted over the New York-Washington cable system.

Whippany, where the Laboratories already had a well equipped laboratory for radio transmitter development, is 22 miles from West Street. The problem given the radio group was to transmit the 10 to 20,000 cycle band with a frequency variation of about 2 db, and a fading limit of about 3 db. It was decided to transmit carrier and both sidebands; an available channel 40-kc wide was found at a mid-band frequency of 1575 kc. Nearness of other transmitters, particularly WEAF which was then located at West Street, added some knotty problems. That involving reflected signals, or "ghosts" which is still very much with the television broadcasters and their audiences, was soon observed. However, reflections and fading were not troublesome during afternoon and early evening hours.

* Record, *May* 1927, *page* 314; *May*, 1947, *page* 191. † Record, *May*, 1947, *page* 191-192.

Synchronization, which now is effected by pulses sent as part of the picture signal, was provided by a continuous signal over a separate channel. For convenience it was generated at West Street and sent by radio to Whippany. Radio considerations for it and the voice channel were not troublesome.

At Whippany there was available a Western Electric 5000-watt broadcast transmitter, which was assigned to the picture channel, and a 50,000-watt experimental transmitter which was used for the speech channel. A shielded room was built to house the low-level circuits and the rather simple "studio" needed for a head-and-shoulders picture.

By early 1927 numerous tests had shown that thoroughly practical systems had been created, over which one person could view a rectangular picture about 2 by 2½ inches, and an audience could view a picture about 2 by 2½ feet. Resolution was about the same for each. On the seventh of April a distinguished audience in the Auditorium at West Street was greeted by Walter S. Gifford on behalf of A T & T and F. B. Jewett for the Laboratories. After a popular explanation of the system by Dr. Ives, Herbert Hoover in Washington spoke to Mr. Gifford while the audience watched. Then, various people at Washington spoke to their acquaintances in New York.

A feature of the program from Whippany was a recital, to a musical accompaniment, by Mrs. Halsey Frederick, who thereby became the first of a long line of TV entertainers. All of the engineers took their turns at the transmitter, telling of the apparatus and their own part in the job.

On the days following, everybody in the

*Three of the big photo-electric cells like that held by Dr. Ives were used to convert light to electric signals.*

*Bell System television antennas: Whippany, 1927; Cedar Mountain on the radio relay system, 1952.*

Laboratories had a chance to see the transmission from Washington. Newspaper coverage was liberal; it was evident that the public was keenly interested and eager for television; to those close to the demonstration, today's widespread use of television is no surprise.

This story can best be concluded by a quotation from Dr. Ives' article written when television for the general public was just around the corner.*

"In the years that immediately followed, a number of developments were announced which together embraced practically all the applications of television that have thus far offered promise of general use. In 1928, the development of large dimension apparatus of great light gathering power permitted outdoor scenes to be televised by daylight. In 1929, television in color by a three-color, three-channel method was shown. In 1930 a complete two-way telephone-television system was set up between the Laboratories and 195 Broadway. It was maintained for over a year, and was used by more than 10,000 people. While these developments were not ready for exhibition in 1927, they were nevertheless all scheduled and in part worked out then, so that they belong properly in the account of the launching of television at that time.

"For the study of the transmission problem, which is the peculiar obligation of the telephone industry, the apparatus of 1927 served well. By its use the fundamental data were obtained which guided in the transition from the open-wire line to the coaxial cable, on which television images were transmitted ten years later in 1937, and from line of sight radio to the radio relay system which was inaugurated by the Bell System in 1947.

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* RECORD, *May*, 1947, *page* 193.

*Above – Television receiving tube. The entire area of the plate was illuminated by a glow discharge, modulated by the video signal. The viewer's eye, however, saw only one point at a time through one of the holes in a disc. These holes were arranged in a spiral and as the disc revolved each hole traced a separate path across the illuminated field.*

*H. E. Ives holds one of the photoelectric cells used for television transmission. G. R. Stibitz is at the right.*

# Laboratories Develops Army Telephone Set

A portable field telephone set—one that "listens" and "talks" much better and has a number of new wrinkles to gladden the heart of G.I. Joe—has been developed by the Laboratories to meet the forward-looking program of the Signal Corps.

The new set—the first since the well-known EE-8 used in World War II and Korea—embodies all the new technical knowledge and telephone experience acquired in the last 15 years. Basically it has been modeled to a considerable extent after the new Bell System 500-set which has recently gone into production. Designed to meet the performance requirements of the Signal Corps Engineering Laboratories the field set has been markedly altered for military use and incorporates a number of special military features.

Here are some of the high-lights of the new set, in addition to its superior transmission, which G.I.'s are expected to welcome:

It is lighter in weight, about eight pounds compared to the eleven pounds of the present set, thanks to lighter weight components and the use of light weight magnesium in the container. It is smaller, too, about the size of a loaf of bread. It is rugged; tough new plastics are used for the handset, and the entire set is expected to survive parachute drops with ease. It is very flexible; different circuit arrangements are available with the flick of a switch—common battery, local battery or a combination of these. In an emergency the set operates efficiently for several miles without batteries—on voice power alone.

The handset is shaved at the receiver end so it can fit beneath a battle helmet with comfort, while it can be operated by a soldier wearing long, heavy Arctic mitts. It works effectively at 40 degrees below zero or in the heat of 130 degrees, and at altitudes over 10,000 feet. It can be dunked in water without effect; the entire set is waterproofed by a series of gasket seals. The mouthpiece, or transmitter, stands up nicely to nearby gun blast.

The signal "bell"—actually a sharp tapping sound such as a woodpecker makes—can be adjusted in loudness from complete silence, through a whisper, to a loud penetrating alarm.

Like the telephone set in your home or office, the new set is a basic unit of the military communications network. The new military set can be connected by wires directly to another set, to a switchboard or, with the flick of a switch, to a remote transmitter for radio communication.

*In the new telephone set, the handset is shaved at the ear-piece end so it can fit comfortably beneath a battle helmet, and the "press-to-talk" switch can be operated when wearing Arctic mitts. Tony Prestigiacomo posed the picture.*

The set was developed under a contract between the Signal Corps and Western Electric. Thus the set reflects both the Laboratories' and Western's long experience in coordinating telephone development and manufacture as well as the Signal Corps' knowledge of field requirements and combat experience. It will soon undergo rigid engineering tests by the Army.

The circuitry of the new set is basically the same as that of the new Bell System 500-type set, with a powerful transmitter and an automatic equalizer to adjust this power to varying requirements; an extra sensitive receiver also controlled by the equalizer, with built-in protection against "clicks" from power surges; and other improvements to assure high-quality performance.

An example of the care and planning that have gone into the new set to make it as near perfect for the soldier in the field as is humanly and technically possible is the design of the "press-to-talk" switch on the handset. While a definite pressure is needed to push the switch down, it can be held down with relatively little pressure, a special feature aimed

to avoid undue fatigue for the user. This, too, can be operated with Arctic mitts.

The "woodpecker" calling signal is pitched at a frequency which has been found best for hearing in the presence of background noise, and one which humans can hear best even when their hearing has been dulled by combat fatigue. The possibility of reducing the signal to a whisper or even silencing it completely is highly desirable for outposts in exposed positions.

The new magneto generator for the set was furnished by the Signal Corps Engineering Laboratories. This generator is "free-coasting" and can be spun by finger-tip operation either with or without Arctic mitts.

The new set retains a special arrangement of the older set which was specifically designed for use under extreme field conditions, in this case, in very cold temperatures. On local battery operation, the set gets its power from a pair of ordinary flashlight batteries which are enclosed in the container. In very cold weather, however, such batteries become so sluggish they do not provide enough power. In the new set, arrangements are made for wiring the set to a pair of batteries which the soldier can carry in his pocket, next to his body, where it's warm enough to ensure efficient operation.

An unusual problem in the design of the set was posed by two military requirements; first, that the set be entirely waterproof and, secondly, that it be transportable at altitudes as high as 50,000 feet. The first could be easily met by completely sealing the set with gaskets; but then, at 50,000 feet, there would be normal air pressure inside the set but very little air pressure on the outside—an imbalance that might cause serious mechanical distortion or even breakage. Bell Laboratories engineers solved the difficulty by inserting tiny ceramic valves in the set and in the handle of the handset. The ceramic—about the size of the head of a carpet tack—allows air to pass through so that air pressures inside and outside the set are the same at any altitude—and yet it keeps water out.

*E. F. Watson, left, receives his fellow townsmen's testimonial from Congressman Gamble.*

## Labs Engineer Praised for Public Service

Edward F. Watson, Director of Telegraph Development, was honored at a testimonial dinner given him early in February at the Washington Arms Restaurant in Mamaroneck. The occasion was to mark Mr. Watson's retirement from public life last December 31, when he completed his term of service with the Town Council of Larchmont.

Active in various offices since he came to live in Larchmont in 1923, Mr. Watson has held the offices of Larchmont trustee, Mayor and Town Councilman. A representative gathering of 225 persons extolled Mr. Watson as their "Citizen No. 1" and a public official who was "conscientious, self-sacrificing and untiring" in his service to his community.

Among the awards received by Mr. Watson at the testimonial dinner was a gold police badge presented by Cecil W. Borton, chairman of the Town Police Commission, and a gold Atmos perpetual clock presented by Cornelius J. Quinn, secretary of the Police Commission. A resolution passed by the Town Council of Mamaroneck extolling Mr. Watson's virtues as a councilman was presented by Congressman Ralph A. Gamble.

## Bibliography of Automatic Controls

The Bureau of Reclamation of the Department of the Interior has recently published a Bibliography of Automatic Controls prepared by F. Stenger and R. M. Ancell and designated Technical Bibliography No. 212. It lists all publications on the subject during the last thirty years, and gives a brief digest of most of the references. Requests for copies should be addressed to: U. S. Department of the Interior, Bureau of Reclamation, Federal Center, Building 53, Denver, Colorado. Attention: Librarian.

*The Committee: F. D. Leamer, Ralph Bown, W. H. Martin, A. B. Clark, J. S. Edwards, Secretary, and S. B. Cousins, Chairman.*

# Employees' Benefit Committee Annual Report—1951

In compliance with the provisions of the "Plan for Employees' Pensions, Disability Benefits and Death Benefits" the Employees' Benefit Committee submits the following report for the year 1951.

During the year the total Benefit payments under the Plan made by the Trustee of the Pension Trust Fund and by the Laboratories was $5,109,695. Of this sum $913,982 was paid by the Trustee from the Pension Trust Fund and $4,195,713, including $3,625,730 paid into the Pension Trust Fund to provide for future service pensions, was paid by the Laboratories under the Benefit Plan. In addition, the Laboratories paid $327,536 to the Federal Government for old age benefit purposes under the Social Security Act.

During 1951 there was an average of 6,461 employees, of whom 5,420 had two or more years of service and were eligible to sickness and death benefits under the Benefit Plan, in addition to the accident benefits to which all employees are eligible.

From a health standpoint 1951 was a good year. The frequency of sickness benefit cases decreased 8 per cent and on-duty accidents 56 per cent.

In the course of the year 65 employees were retired with service pensions. As of December 31, 1951, there were 441 retired employees on the service pension roll. Disability pension payments were being made by the Laboratories to 20 retired employees.

Twenty-one employees in active service and 17 retired employees died during 1951 and death benefits were authorized in accordance with the provisions of the Plan.

There were 86 leaves of absence in effect at the beginning of 1951 and during the year 160 were granted and 101 terminated, leaving a total of 145 outstanding as of December 31, 1951. Of these, 66 are granted for military service.

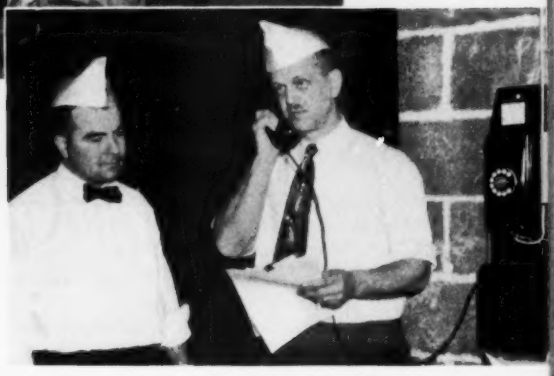
The members of the Employees' Benefit Committee are S. B. Cousins, Chairman, R. Bown, A. B. Clark, F. D. Leamer and W. H. Martin, and as alternate members J. W. McRae, B. R. Young, M. R. McKenney and M. H. Cook. J. W. Farrell and Dr. C. E. Martin act as counselors to the Committee. J. S. Edwards is Secretary, K. M. Weeks Assistant Secretary.

J. S. Edwards, *Secretary,*
*Employee's Benefit Committee*

## Benefit Payments for Year 1951

| | |
|---|---|
| Payments by Trustee from Pension Trust Fund | |
| Service Pensions | $ 913,982 |
| Payments by Laboratories into Pension Trust Fund | 3,625,730 |
| Other Payments by Laboratories: | |
| Disability Pensions | 21,347 |
| Accident Benefits and Related Expenses | 13,855 |
| Sickness Disability Benefits | 356,090 |
| Sickness and Accident Death Benefits | 134,596 |
| Payments Following Deaths of Retired Employees | 44,095 |
| Total Benefit Payments under Plan by Trustee of Pension Trust Fund and Laboratories | $5,109,695 |
| Payments by Laboratories to the Federal Government for old age benefit purposes under the Social Security Act | 327,536 |
| Total | $5,437,231 |

The balance in the Pension Trust Fund on December 31, 1951 was $36,318,311. This Fund is irrevocably dedicated to the payment of Laboratories pensions and can be used for no other purpose.



*Above – The Communications Center during the drill–seated, G. W. Lees, R. C. Carrigan, E. H. Kampermann and W. C. Pitman and standing, I. W. Whiteside, A. J. McGuiness and R. N. Larson; left–R. H. Wilson, Area Manager, broadcasts to people in the shelter areas and Mr. Whiteside is at the control panel; and right–Shelter Warden W. S. Gunnarson reports to the Communications Center that all his areas are cleared as Area Warden F. N. Maguire stands by.*

# Murray Hill Air Raid Drill

Murray Hill's first air raid drill, held on February 27, was termed a complete success by those who observed the test. The warning signal was sounded from the Control Room at 3:04 p.m. by a steady ringing of the fire bells. Seven minutes later the last warden had reported everyone in his area in shelters and the All Clear was sounded. Commenting on the drill, C. S. Weiler, New Jersey's Deputy State Director of the Division of Civil Defense said he was "very much impressed by the manner in which your employees conducted themselves and the safety of your shelter areas."

When the alarm sounded area wardens assigned to stairwells on each floor proceeded to clear people from their areas and follow them down stairs to the shelters. Meanwhile the fire department, which numbers about 50 well trained men, assembled in three groups, one each in Buildings One and Two, and one in the garage to man the fire truck.

As each area warden entered the shelter he reported to the shelter warden that his area was cleared. When all the areas served by a shelter had been cleared the shelter warden reported to the Communications Center over a special telephone circuit which is independent of outside power sources. R. H. Wilson, Area Manager, broadcast to the shelter areas over a loudspeaker system from the Communications Center during the drill.

Special provisions were made for taking care of visitors. Members of the American Legion reported to the Reception Room and escorted visitors they found there to a shelter, returning them to the Reception Room after the All Clear. Gate guards closed their gates and proceeded to a shelter, bringing any visitors on the grounds with them.

Murray Hill's Civil Defense Organization of 600 people is headed by T. J. Crowe, with G. W. Lees as Deputy. About 220 air raid wardens are headed by W. C. Pitman and more than 200 first aiders are under R. N. Larson. A. F. Leyden heads the demolition and rescue experts, A. J. McGuiness, the fire department, and B. S. Biggs, the decontamination squad. Communications are under the direction of I. W. Whiteside, guarding and protection of buildings under E. H. Kampermann, and J. G. Segelken is coordinator with State and local Civil Defense Organizations.

# The "New Look" in Pass Photos

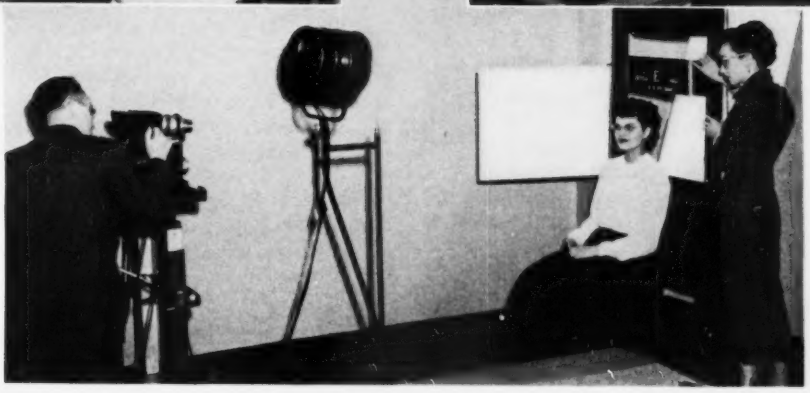
Eight years ago, everyone in the Laboratories was photographed for a then-new identification card. Meanwhile, faces have changed, cards have been lost. In the interest of greater security, it was decided to issue new cards bearing new photos.

For this job some new equipment procured by the Photographic Department has been producing pass photographs far superior to those obtained with the previous equipment. The basic element is a Beattie "Portronic" camera which is synchronized with a high-speed or "strobe" light. Conditions of exposure have been completely standardized and the photographer is required only to adjust the height of the camera and then press a hand switch.

Sittings are scheduled by the Office Service Department in a highly streamlined manner. The person to be photographed reports to a receptionist who records the name and data required. This is set up on a plush board and photographed with the subject. So quickly can the entire procedure be handled that over 200 people can be photographed in about 3 hours.

The camera can be loaded with a hundred feet of 70-mm film and the motor-driven magazine transports the film automatically after each exposure. Although exposure is made by a single flash, careful use of reflectors eliminates a harsh, flatlighted appearance.

After processing, one print is attached to the identification card, and both are sealed in a vinylite enclosure. Each employee will be notified and asked to exchange the old card for the new. "Shooting" began at West Street on February 28, and the first run through the alphabet was finished on March 11. The Murray Hill run will begin on April 7.



*Above, left—First step for Naomi De Hart is to sign her employee identification card which Helen Metzler has ready; above, right—Catherine Carolan and Alliene Pando set up the name Boards; center, Naomi sits for her portrait, as Norma Beasley puts the name board in place. Jack Stark is the camera man. Later the identification card and photo will be sealed in a vinylite enclosure.*

## American Physical Society Meets at Columbus

The 312th meeting of the American Physical Society was held March 20, 21, and 22, at Ohio State University in Columbus, Ohio. At the morning session on Friday, J. R. Haynes and H. B. Briggs presented a paper, *Radiation Produced in Germanium and Silicon by Electron-Hole Recombination*, M. B. Prince and F. S. Goucher spoke on *Test of Transistor Equation*, and G. L. Pearson, W. T. Read, and W. Shockley gave a paper, *Probing the Space-Charge Layer in a p-n Junction*. In the afternoon, H. W. Lewis gave the paper, *Energy Levels of a One-Dimensional Bose Solid*. The Saturday morning meeting on Low Temperature Phenomena included an invited paper, *New Supraconducting Compounds*, by B. T. Matthias. At the same time, in a session on Metals, J. K. Galt and Conyers Herring gave a paper on *Elastic and Plastic Properties of Very Small Metal Specimens*. In the afternoon, G. H. Wannier presented an invited paper on *Progress in Computing the Statistics of Cooperative Assemblies* in a session on Second-Order Phase Changes.

## Laboratories Receives a Long Lines Souvenir

A sixty-year old telephone pole, fifty feet long and thirty inches in diameter at the base, was retired recently at Maumee, Ohio. A six-foot section was cut off and sent to Outside Plant Development for study.

Still solid and sturdy, the huge eastern red cedar was installed in 1892, only seven years after the incorporation of the American Telephone and Telegraph Company. It was No. 11040 in the New York to Chicago line, then the longest telephone circuit in existence. A line to Cincinnati began here.

Used as a terminal pole for this open-wire line until it was retired, the giant had raised as many as twenty-four cross-arms to the sky at one time.

*A line crew prepares to remove Old 11040.*

*George Lumsden points out the slight amount of ground line decay in this red cedar pole. Heartwood, however, is seriously affected.*

## Model Railroad Club to Hold Show

The Bell Laboratories Model Railroad Club has announced plans for the 1952 Show to be held on April 22, 23 and 24 at West Street; May 6, 7 and 8 at Murray Hill; and May 20, 21 and 22 at Whippany.

It is planned to show a variety of equipment including scale and a few tinplate (toy) models in a broad range of gauges. Members have been asked to lend the club their interesting items of equipment for display during the show. J. A. Robison, Room 731 at West Street, is receiving entries. If anyone in the Laboratories has a trackless cast iron pull train, please notify Mr. Robison as he would like to exhibit one in the show.

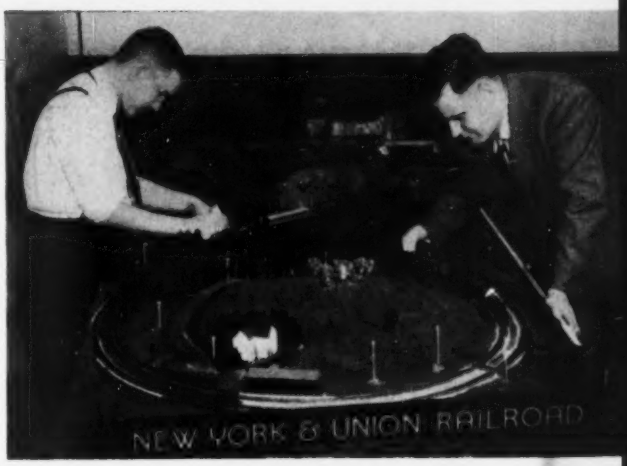
## James Campbell Moves to Winston-Salem

James Campbell, Jr., who has been Technical Publication Supervisor in the Publication Department, has transferred to Western Electric, and will be located in that company's Radio Shops at Winston-Salem. Mr. Campbell has been selected to organize a sizable group of writers, illustrators and production people to prepare instruction books on Western Electric equipment for the armed forces.

With a degree from College of William and Mary, Mr. Campbell joined Bell of Pennsylvania in 1930 as an equipment engineer. He transferred to the Laboratories in 1942, where he taught in the War Training School and prepared instruction manuals. Four years later he joined Publication, where he has since been responsible for the clearance of technical material for security reasons with the Military services and for some phases of our College Relations program.

## Out-Of-Hour Lecture on the Transistor

The fifth of the current series of informative lectures was given by J. A. Morton in the West Street auditorium February 18, at which time Mr. Morton discussed *The Transistor–Three Years After Invention.* During the period since its invention a little over three years ago, intensive development work has been directed toward improving the reproducibility and reliability of the transistor. Efforts have also been made to make the new devices applicable to the wide range of desirable characteristics needed in modern communications. Mr. Morton described the progress that has been made in reducing the limitations of the transistor and extending the range of performance and usefulness in communication systems. He also stressed the advantages of the new device to applications that require extreme miniaturization and low power consumption.




*Paul Mallery, left and J. A. Robison, right, make some adjustments in the roadbed and rolling stock of the New York & Union Railroad. The "N.Y. & U." owned and operated by Bell Telephone Laboratories Model Railroad Club, was built by members during their lunch hours. It is "TT" gauge, and is extremely realistic in layout, operation and background detail. (Note to the uninitiated: "TT" is an abbreviation of "Tabletop" and refers to a track gauge of about one-half inch. More accurately, the distance between rails measure 0.476 inch.)*

## Turkish Telephone Men Visit Murray Hill

Ten Turkish engineers, completing a survey sponsored by the Mutual Security Agency of American telephone engineering techniques, recently visited Murray Hill in the final phase of their trip before departing for Turkey. Previously, they had completed six months of intensive work in various divisions of the Michigan Bell Telephone Company during which time they acquired a fund of practical operating experience. Accompanying the visiting engineers on their trip were B. E. Osgood and L. F. Bilby of the Michigan Company and E. E. Bartleson of A T & T.

At Murray Hill, various aspects of telephony were discussed with W. H. Martin, A. F. Bennett, R. J. Nossaman and P. G. Edwards. Before the tour was completed the party was

J. M. HOAGLAND

J. R. WHITAKER

D. S. WOLLEBACK

## CALLED TO ACTIVE DUTY

Laboratories men who have joined the military services within the past few weeks include **J. M. Hoagland** of Outside Plant Development in Murray Hill, **J. R. Whitaker** of Standards and Drafting in New York and **D. S. Wolleback** of Murray Hill's General Service Staff.

Jim Hoagland, who has been with the Laboratories since 1940, returned to active duty with the U. S. Air Force in the rank of 2nd Lieutenant, which was his reserve status. J. R. Whitaker, a Navy reservist, returns to active duty as an Apprentice Airman E-2. Dmitri Wolleback has enlisted in the Air Force.

joined by H. T. Balch of Transmission Systems Development, an interesting addition in view of the fact that Mr. Balch's father is Telephone Technical Advisor in Turkey for the ECA.

The introduction of party lines stands high on the list of proposals which the group will take back to Turkey. Adnan Bayboru, leader of the group, declared that his country, which is short on equipment, should use them.

He admitted that it would take some public relations work to obtain popular acceptance of the party line. On the other hand, the pent-up demand for new service may make multiple lines more acceptable. In the major cities of the country, there are at least as many people waiting for service as there are subscribers.

## Laboratories Activities at the 1952 I.R.E. Convention

A number of Laboratories engineers had a prominent part in the technical program of the 1952 I.R.E. National Convention during March.

J. A. Morton spoke on *Equivalent Circuits* and J. H. Felker on *Transistor Pulse Circuits,* at a symposium on Transistor Circuits. At a session on Information Theory I—Coding Procedures, B. M. Oliver presented a paper on *Efficient Coding,* E. R. Kretzmer on *Television Signal Statistics,* and C. W. Harrison on *Experiments with Linear Prediction in Television.* A. G. Fox gave a paper on *New Guided Wave Techniques for the Millimeter Wavelength Range* at a session on Microwaves I—Waveguides A, presided over by G. C. Southworth. At another session, Microwaves II—Waveguides B, W. W. Mumford presented a paper on *The Optimum Piston Position for Coaxial-to-Waveguide Transducers,* and W. C. Jakes, Jr., spoke on *Waveguide Matching Technique.* The session on Propagation included two papers, one by Kenneth Bullington entitled *Radio Transmission Beyond the Horizon in the 40-4,000 Mc Band* and S. O. Rice on *Statistical Fluctuations of Radio Field Strength Far Beyond the Horizon.* H. T. Budenbom gave his paper, *Further Transmission Analysis of Hybrid Rings,* at the session on Microwaves III—Filters and Circuits. In the session on Feedback Control, D. Leed spoke on *AFC System Analysis by Electromechanical Analogue.* J. G. Linvill presented a paper on *Network Alignment Technique* at a session on Circuits I. W. M. Goodall presided at the Radio Communication Systems session where J. R. Pierce and A. L. Hopper gave a paper on *Nonsynchronous Pulse Multiplex System with Random Sampling.* This session was organized by W. W. Mumford. C. D. Owens presented a paper on *Analysis of Measurements on Magnetic Ferrites* at the session Circuits V. E. P. Felch presided at the meeting Instruments II—Electronic Measurements A. A. G. Jensen organized and presided at the symposium on Present Status of NTSC Color Television Standards. A. G. Fox and P. H. Smith presided at the sessions Antennas II—Microwave A and Antennas III—Microwave B, respectively. A symposium on What's New in

Mobile Radio was organized by Newton Monk.

Convention Committees included several laboratories engineers. W. H. Doherty was a member of the General Committee and was also Chairman of the Technical Program Committee. With Mr. Doherty on the latter were A. A. Roetken, Vice-Chairman, George Nielsen, Jr., Secretary, A. G. Jensen, Newton Monk, and W. W. Mumford. Mr. Jensen and R. A. Heising were also members of the Institute Activities Committee.

An interesting non-technical symposium on Management of Research and Development was one of the highlights of the convention. In this symposium, a panel of representatives with broad backgrounds of experience and accomplishments in research and development activities discussed their philosophies. G. N. Thayer spoke on *The Responsibility of the Engineering Manager.* A brief abstract of his remarks, as released by the I.R.E., follows:

The assumption is made that the useful output of a research and development organization stems directly from the thoughts of the people in it. The job of the manager is to optimize the quality and quantity of this output. Three rules which seem basic are given and their broad implementation discussed.

They are:

1. Put the right man on the right job and be sure that he understands the job in its broadest aspects.
2. Give him responsibility and authority so that he can do the job.
3. See that he is rewarded in terms of salary and recognition for the sort of job he does.

Three of the basic drives which affect human conduct are given as follows:

1. A man needs a sense of dignity–the sense that he is an individual is important and that others recognize it.
2. A man needs a sense of security.
3. A man needs a sense of belonging to the group. He is a social being and tends to associate with those who share his interests. A large part of his existence is spent on the job and it is therefore important that this need be recognized. Research and development teams properly organized and informed will go a long way toward satisfying this urge.

It is concluded that the rules for managers when carried out with recognition of these basic drives will go a long way toward establishing good human relations on the job.

## Emergency Radio Station for Scotch Plains

A short time ago, a group of radio amateurs including H. O. Emmons and D. W. Baake of Murray Hill volunteered their services to the Mayor and Township Committee of Scotch Plains as radio operators. The plan to set up an emergency radio station to act as an auxiliary to the police radio system was favorably accepted. Funds were made available and under the "hams' " supervision, equipment was purchased and the station was well under way.

Each man holds a First Aid Certificate, is a Reserve Police Officer of Scotch Plains and has received a ten weeks' course in police training and techniques. During air-raid alerts two men are assigned to the headquarters station and the remainder to appointed positions in the township with two-way radio systems installed in their automobiles.

*Don Baake has this elaborate rig at home.*

*Orville Emmons and his station W2QJR in Scotch Plains.*

# SERVICE ANNIVERSARIES

## Anthony Grieco, 35 Years

Shortly after Anthony Grieco came to the Laboratories he entered the Transmission Laboratory where he was engaged in testing and investigating non-Western Electric apparatus. At this time, comprehensive articulation studies covering the intelligibility of instruments and circuits were inaugurated and he became engaged in this work. World War I found him spending much of his time making articulation tests of transmitters used in gas masks and transmitters and receivers in the helmets used by airplane pilots.

Anthony Grieco

G. H. Keillen

Following the war, Mr. Grieco transferred to the acoustical research group, where he assisted in making hearing studies and in the development of audiometers and cone-type loud speakers. He was also quite intimately associated with the design and development of the artificial larynx; he learned to talk with one of them, and frequently demonstrated its use at technical meetings and informally at the Laboratories. Later, he became concerned with studies of carbon for mechanical amplifiers and repeaters. In 1942, he transferred to Electronics Research, working on X-ray and electron diffraction studies. During 1944 and 1945 he worked on insulating thin tape cores by the cataphoresis process in the magnetic applications group. More recently, he has been concerned with measurements of the thermal conductivity of germanium and of barium titanate, and has also assisted in studies of noise in transistors.

For many years the Griecos lived in Fordham, but for the past ten years have lived in Summit so as to be close to Murray Hill. They have two sons, one a student at Seton Hall University and the other in the Summit High School. While reading is Mr. Grieco's main diversion, his friends say that he is an ardent Yankee baseball rooter and follows his favorites religiously.

## George H. Keillen, 35 Years

Soon after George Keillen joined Apparatus Drafting in 1917, he went into the Navy, then returned and resumed drafting on manual and dial apparatus. From 1922 to 1940 he worked on specialty products such as radio broadcast transmitters and public address systems, being located at Graybar-Varick, Kearny, Whippany and Murray Hill. With the advent of World War II, Mr. Keillen returned to the Whippany drafting group where he worked on the famous SCR-545 anti-aircraft radar, and several airborne radars. Recently he has been concerned with the Laboratories' developments in the radar and guided missile fields.

The Keillens live in Rutherford. They have a daughter, a son-in-law and one grandson. Mr. Keillen bowls in the Whippany League.

## Members of the Laboratories Who Will Receive Service Emblems on the April Dates Noted

★★★★★★★

A. Grieco ..... 30th
G. H. Keillen .... 16th

★★★★★★

H. H. Abbott ..... 3rd
E. G. Andrews .... 3rd
C. Flannagan .... 23rd
L. A. Kille ..... 17th
N. Monk ..... 22nd
C. Tanis ..... 26th
D. Wallace ..... 21st

★★★★★

Marie Adams .... 20th
O. J. Barton ..... 14th
S. Bobis ..... 5th
M. Brotherton ... 25th
B. B. Cahoon .... 12th
W. B. Carmichael . 25th
W. J. Connell ..... 8th
W. C. Ellis ..... 20th
J. R. Flegal ..... 20th
A. A. Hauth ..... 26th
G. A. Head ..... 12th
R. B. Hearn ..... 19th
L. N. St. James ... 27th
E. O. Widmer .... 11th

★★★★

H. M. Owendoff . 29th
H. J. Ulrich ..... 3rd

★★★

E. E. Francois .... 27th
J. D. Lawson .... 12th
J. S. McCarthy .... 1st
J. C. Morris ..... 26th
W. W. Van Roosbroeck .... 12th

★★

W. W. Bixby ..... 6th
A. P. Boysen ..... 1st
J. W. Coates .... 24th
J. H. Cole ..... 13th
J. D. Cuyler ..... 29th
W. DiMella ..... 9th
F. P. Dormer .... 20th
R. F. Downey .... 27th
Eleanor Drake ... 17th
Mary Duffy ..... 6th
W. Earl ..... 9th
Bernadette Fullhardt 6th
M. J. Halpin ..... 20th
A. Holowaty .... 30th
R. C. Keyser .... 20th
L. J. Koos ..... 28th
P. S. Kubik ..... 29th
J. P. Larimer .... 14th
J. A. Lund ..... 16th
F. N. Maguire .... 6th
J. E. Monahan ... 21st
L. W. Perry ..... 1st
J. Roberts ..... 29th
R. I. Snyder ..... 13th
Loretta Spacek ... 21st
W. E. Thacker .. 20th
W. Vierling ..... 13th
E. Widmann ..... 6th
Mary Wiggins ... 27th
Elizabeth Wilson .. 6th
A. G. Winn ..... 11th

*Below – J. H. Bollman indicates pressure points to stop bleeding. Right – "Sis" Toepfer applies a pressure bandage to the palm of Vic Dobler's hand.*

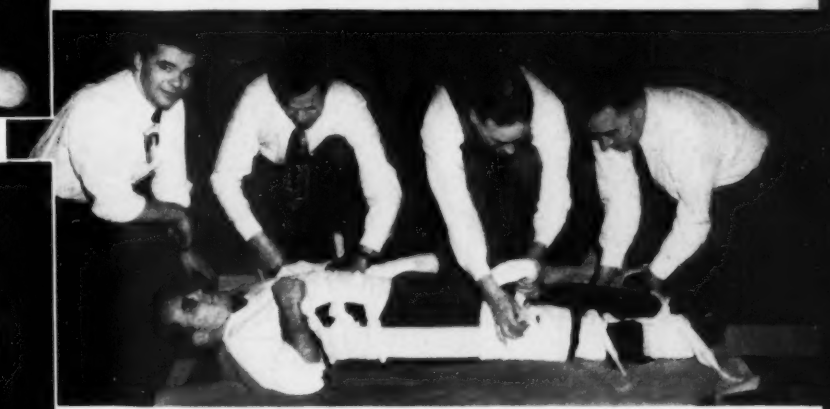
# Civil Defense First Aid Program

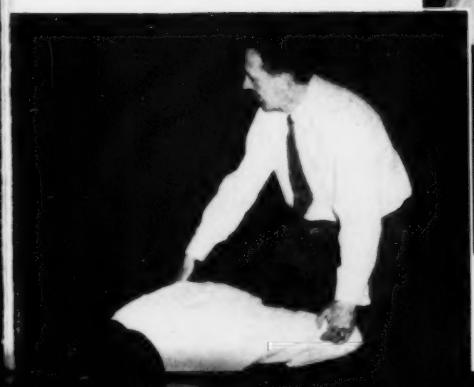
These photographs were taken at Murray Hill during the First Aid course given to nearly 200 there in connection with the civil defense program. Classroom space was made available by clearing the Service Dining Room four afternoons during working hours, over a four-week period ending March 21, with each participant attending for a total of nine hours. The instructors were: M. L. Weber, J. H. Bollman, J. Leutritz, Jr., G. B. Ruble, J. C. Morris, C. E. Kempf and F. T. Wood.

At Whippany A. L. Johnsrud and L. W. Lott, Jr., similarly taught 60 people at that location and, as reported in the January RECORD, the number involved at West Street proceedings was another 200. General supervision was under L. E. Coon of the Safety Department. A certificate will be given to those who, with nine hours of credit thus gained in the civil defense program, complete the additional thirteen hours in a supplementary Red Cross course.

*Right, center – Marion Wood puts a shoulder bandage on Betty Jane Knoss. Right – R. E. Polk practices the application of an ear bandage to D. C. Smith.*

*Left–The new artificial respiration method is checked by Instructor Bollman and further demonstrated in the other picture.*





*Above–Here is a simulated broken thigh which gives four pupils opportunity to apply a fixation splint.*

## Like Father, Like Daughter?

Do a father's way of life and turn of mind influence his daughter? Clarice Lovell has concrete evidence that they do. While her father Clarence A. Lovell was busy developing the gun director during the early years of World War I, teen-age Clarice was developing the idea that a career in science would also suit her. This idea was much strengthened, and given direction, by the pleasant time she recalls having spent working at Murray Hill during the summer of 1944. So when she left the University of Pennsylvania with an A.B. in bacteriology in 1947, she went to work in a doctor's diagnostic laboratory in Philadelphia and, a year later, joined the Laboratories. Her experience in this study of microscopic organisms was put to good account when she became assistant to John Leutritz in the cultivation of pole-eating fungi. Later she assisted F. G. Foster in the preparation of metal specimens for photomicrographical study. Last December she transferred to transistor work, and is currently making electrical tests to track down impurities in germanium. Out of hours, Clarice likes to sing in the Murray Hill Chorus and the choir of the First Baptist Church in Summit.

Parental influences also played a powerful part in bringing Geraldine Tyne to join the Whippany Laboratories last summer. Over her impressionable years she must often have watched her father, Gerald F. J. Tyne, laboring with his comprehensive collection of nearly 6,000 vacuum tubes. During World War II, her mother, a former Latin teacher, became an expert relay coil designer and electroplater, operating, for a time, her own high-speed plating plant. Meanwhile, dinner table conversation in the Tyne home often ran to electronics and, willy nilly, Geraldine, whose personal taste is for writing, especially children's books, listened and learned. So when she was graduated from Caldwell College, New Jersey, last year, she combined her dinner table courses in electronics with her natural interest by becoming one of a group of editors at Whippany who assist in the preparation of instruction books and pamphlets. Apart from writing as a hobby, she is interested in dancing. She studied ballet under Zaraday, and has appeared as a soloist at the Brooklyn Academy of Music.

### "The Telephone Hour"

NBC, Monday Nights, 9:00 p.m.

| | |
|---|---|
| April 7* | Blanche Thebom, *mezzo soprano* |
| April 14† | Ezio Pinza, *basso* |
| April 21 | Jose Iturbi, *pianist* |
| April 28 | Zino Francescatti and Michael Rabin *violinists* |
| May 5 | George London, *bass baritone* |
| May 12* | Lily Pons, *coloratura soprano* |
| May 19 | Nelson Eddy, *baritone* |
| May 26 | Lucile Cummings, *contralto* |

* At Carnegie Hall. † From Hollywood.

*Geraldine Tyne edits government instruction books at Whippany.*

*Clarice shows her father, C. A. Lovell, a specimen she prepared for micrographic analysis.*

# "Welcoming the Newcomers"

A special feature of the Allentown, Pa., *Call-Chronicle*, *Welcoming the Newcomers*, has recently carried stories of Laboratories personnel who have transferred to Allentown. Among these is the story about Louis Von Ohlsen and his family. The *Call-Chronicle* said in part:

The Louis Von Ohlsens are newcomers who have readily adapted themselves to the activities and life in their adopted city—Allentown.

Tall, blond Mr. Von Ohlsen, whose many and varied hobbies go from music, painting, chess and the collection of minerals to the building of an audio system for the family television and record player, is a member of the technical staff at the Bell Telephone Laboratories.

His pretty, dark-haired wife, Marjorie—not to be outdone—also has several interests in the hobby line. These include painting, ceramics and "a bit of writing." She also is learning to enjoy the collecting of minerals, although before her marriage, she confesses she couldn't "tell one stone from another."

Mr. Von Ohlsen's collection of minerals is displayed in one corner of the basement of their house. Here, wall shelves and chest drawers hold various stones ranging from quartz to sapphires in crystal form. Interested in this hobby since his early childhood, he has collected the minerals on camping trips through several states. He and Marjorie are planning some field trips in Pennsylvania this summer.

Most of the stones in the collection are in crude form but a few are cut and polished.

Both the Von Ohlsens do oil paintings, although Marjorie's a little more interested in ceramics. She's a member of the Lehigh Valley Art Alliance.

A better than average chess player, Mr. Von Ohlsen is at present taking part in a chess tournament being sponsored by Western Electric. Just to prove the "better than average" statement, now he is tied for first place.

The Von Ohlsens also are active in amateur theatrical productions. They were the stage managers for the last Civic Little Theatre play, *Erstwhile Susan*, and did the same job for an earlier production, *Goodbye My Fancy*. Last summer, they both had acting roles in *The Morning After*, a Bethlehem Drawing Room Theatre presentation.

Along with all of his other activities, Mr. Von Ohlsen is also an accomplished pianist, having studied music for 15 years. His preference leans toward the classical.

Mr. Von Ohlsen joined Bell Telephone Laboratories immediately following his graduation from Stevens Institute of Technology in New Jersey. His schooling was interrupted by the war when he went into Navy service. He was stationed on Guam for 25 months.

The Von Ohlsens are the parents of two-year-old twin sons, Roderick and Roland. The youngsters are blond like their father, who is of German-Danish descent.

C. G. Von Zastrow

Mary Vallis

P. C. Ryder

## RETIREMENTS

Among recent retirements from the Laboratories are C. G. Von Zastrow with 37 years of service; P. C. Ryder, 31 years; Richard Panse, 9 years; and Mary Vallis, 8 years.

### Curt G. Von Zastrow

After an adventurous youth in the United States, Germany and South Africa, Mr. Von Zastrow returned to this country in 1910 and joined Western Electric's installation forces in 1914. The following year he transferred to the Laboratories. During a two-year military leave in World War I, he was a sergeant first class in the Signal Corps' research and inspection group of the A. E. F. with headquarters in Paris.

Upon his return to West Street Mr. Von Zastrow continued in the toll development group where he took part in the trial installation of two-way telephone repeaters with passive impedance between Davenport, Iowa, and San Francisco. Following this he spent about two years in the method of operations group and then returned to the toll group where he was engaged in laboratory testing and analyzation of Western Electric orders. Since 1937 Mr. Von Zastrow has been associated with the circuit standardization group.

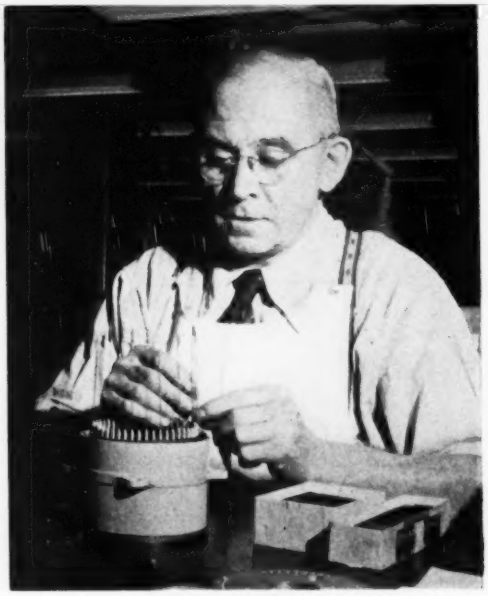
Mr. Von Zastrow and his wife have lived for over thirty years in Chatham, where they expect to remain. His hobbies are gardening, stamp collecting and pastel-painting.

### Percy C. Ryder

For his first thirty-six years, Percy Ryder was something of a rolling stone. Starting to work for Western Electric at fifteen years of age and ten cents an hour, he held half a dozen jobs, including that of welding foreman and an instructor in bookkeeping. In 1923 he decided to settle down so he joined the Laboratories as a supervising clerk in the Receiving Department. Six years later he became an analyzer and expediter of shop orders in Commercial Relations; our then considerable business in quartz crystals was in his area. He was at the Ocean Gate ship-to-shore station during the construction period to handle commercial work.

During the war Mr. Ryder was in charge of commercial activities at Deal, where he analyzed drawings, ordered materials and supervised the stockrooms. Returning to West Street in 1947, he has since been in the Projects group which handles commercial details mostly on military jobs.

When he went to Deal, Mr. Ryder and his



Richard Panse

wife moved to the town of Interlaken nearby. Because he is fond of surf-casting and because their son and two grandchildren live nearby, the Ryders plan to remain there. A daughter and two more grandchildren live on Staten Island. Blessed with good health—for which he credits the Medical Department with an "assist"—Mr. Ryder looks forward to a lot of happy activity in retirement. He is a founder and secretary of the Grand Jury Association of Monmouth County.

### Richard Panse

After Richard Panse had served four years as an apprentice machinist in his native Halle, Germany, he traveled throughout Europe for a couple of years, then settled in Hamburg to work on precision machinery. At twenty-six he was an assistant superintendent and then World War I swept him into the Army. Because of his skill he was later released from service and became an instructor for his firm's new customers.

In 1923 Mr. Panse came to the United States; the following year he brought over his wife and son. From tool and die-making he became a maintenance man in a bookbindery and later its shop superintendent. Nine years ago he joined the Laboratories as an instrument tool maker; during the war he worked on submarine and airborne apparatus. Living in Bellmore, he can readily follow his hobby of deep sea fishing.

### Mary Vallis

Mrs. Vallis, after eight years of service as print reproduction operator at Whippany, retired at the end of February. Prior to that, she was very busy bringing up her nine children, seven of whom are now living in or near Morristown. Five members of her family are or have been Bell System employees.

Mrs. Vallis is still the ever young, light-footed, and smiling person whom fellow employees can never forget. It is not surprising to find that her three daughters are long-term New Jersey Bell Telephone Company employees, holding responsible positions in business and personnel training work.

## Forthcoming Retirements

The following retirement dates may be of interest to readers of the Record:

| | |
|---|---|
| Edward J. White | April 12, 1952 |
| James R. Irwin | May 1, 1952 |
| George C. Vigouroux | May 1, 1952 |
| Louis T. Cox | June 1, 1952 |
| Reginald H. Colley | June 1, 1952 |
| Morris P. Sherwood | June 1, 1952 |
| William A. Bollinger | June 1, 1952 |
| Frank J. Boyle | June 1, 1952 |

Because of accrued vacations, the last day worked may be earlier than the date given.

## Women's Committee Holds George Washington Party

The Women's Activities Committee of the West Street Pioneers sponsored a George Washington party on February 20 which began with a hot buffet supper in the Cafeteria before the group gathered in the Game Room.

Highlight of the evening's entertainment was the showing of Kodachrome slides by

*S. M. Ray shows slides of historical Virginia to Women's Activities Committee.*

S. M. Ray and his wife which included scenes from historical Virginia. Also shown were some slides taken by a group of the women themselves during the course of a trip taken about two years ago to Williamsburg and the Amish country.

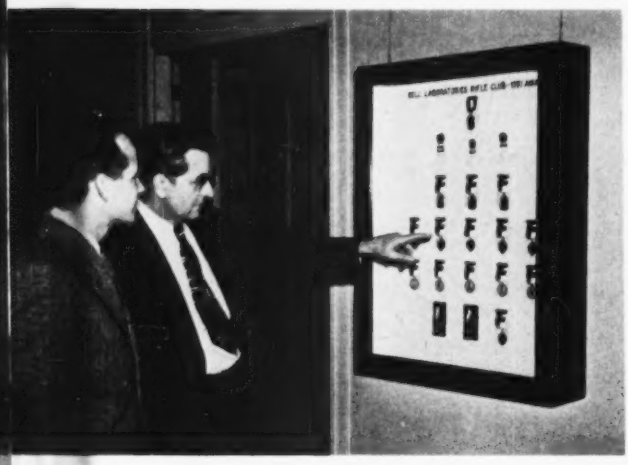
The "Drum Table" which carried "white elephant" gifts donated by the members was laden with appropriately wrapped gifts. The kittens, made of white soap, wash cloths, and pipe cleaners, were very popular.

Refreshments, always well received, were served in the Game Room to wind up a successful evening's entertainment.

## Riflemen Show Their Medals

An exhibit of shooting awards was displayed by the Rifle Club in the Murray Hill lounge recently. The medals shown had been awarded for the various kinds of shooting in which club members had participated during the past year.

Important awards included the National Rifle Association Bronze Medal, awarded to George Seidel as the best all around shooter in gallery, small bore and big bore; Silver Qualification Medals, awarded by the Director of Civilian Marksmanship to 27 members who qualified with the service rifles; a gold and silver medal awarded by the New Jersey Civilian Rifle League to the high and second high shooting members of the gallery rifle team; and medals awarded by the Club to the high shooter in each of the expert, sharpshooter and marksman classes for big bore and for other similar shooting achievements.



*The Rifle Club heads into another active program this year and suitable awards will be presented at the year's end to the high scorers.*

These awards indicate the quality and quantity of the shooting accomplished by the Club members during 1951.

## News Notes

CUSTOMER TOLL DIALING, put into effect in Englewood, New Jersey, on a trial basis last fall, continues to prove highly satisfactory, and plans are being formulated for extending this new service as fast as conditions warrant. There are many problems to be solved and many obstacles to be overcome. Certain of these were discussed by F. J. SINGER before a joint meeting of the Seattle sections of the A.I.E.E. and I.R.E. on February 28. On March 4, Mr. Singer discussed the same factors before a similar joint meeting of the Portland sections.

R. C. MATLACK of the Switching Engineering Department together with J. V. Moses and C. W. Anderson of the A T & T recently visited Atlanta, and New Orleans to discuss, with engineers of Southern Bell, methods of permitting increased resistance in subscribers' loops, the need for which has been accentuated by the present shortage of copper. While there, they also discussed problems relating to the introduction of customer toll dialing in step-by-step areas.

TO PERMIT A MUCH larger number of subscribers in the Detroit area to dial their short-haul toll calls directly, a centralized automatic message accounting type of crossbar tandem office is being planned for Detroit. OSCAR MYERS of the Laboratories and Messrs. Rupp, Brady, Palmer, and Drum of the A T & T were recently in Detroit to discuss various phases of this new undertaking with engineers of the Michigan Bell Telephone Company.

W. SHOCKLEY spoke on *Transistor Physics* at a general physics colloquium at Cornell University. At the A.I.M.M.E. meeting at the Hotel Statler in New York he delivered the Annual Institute of Metals Lecture. The title of his address was *Solid State Physics in Electronics and Metallurgy.*

R. K. HONAMAN spoke before the Baltimore Section of the Instrument Society of America at the Engineers' Club of Baltimore on January 11. The subject of his talk was entitled, *Frontier of Communication.*

W. J. PIETENPOL spoke on *Transistors Today* at a meeting of the Fox River Valley Section of A.I.E.E. in Appleton, Wisconsin, February 7. Mr. Pietenpol described and demonstrated some of the characteristics of the transistor.

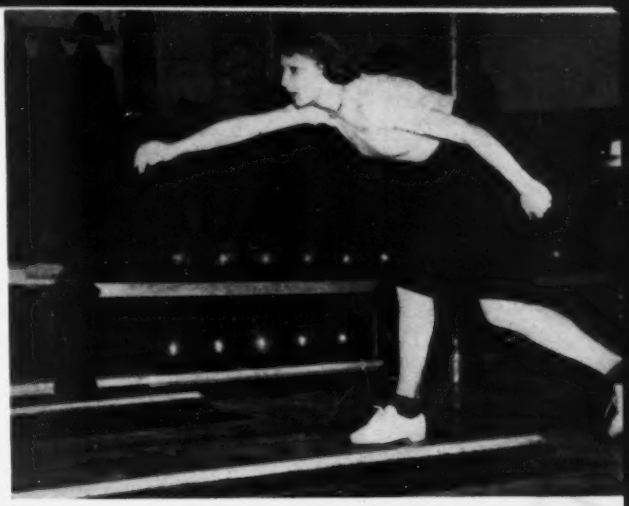
E. K. VAN TASSEL spoke on *The Type-N Cable Carrier Telephone System* at a meeting of the Toledo Section I.R.E. on February 19.

W. F. SIMPSON and E. R. CASEY were at the Patent Office in Washington relative to patent matters.

A PROMISING but still rapidly evolving technique is that of potting transformers and other transmission apparatus in thermosetting resins. A new variety of compound was discussed by N. J. EICH and W. J. CLARK with Western Electric engineers at Haverhill.

*Right – High bowler on the Cables team is Caryl Geisenhainer.*

*Below – Rose Wilkins chalks up before going into action for the Dials.*



## West Street Women's Bowling Club

Catherine Durnan is chairman and it meets on Thursdays at the Village Recreational Center, 91 West Third Street.

*At the scoreboard, left to right, Joan Michel, Audrey Harrington, Sally Lem, Gloria Corich, Virginia Merrill, Elizabeth Bates, Frieda Schulz and Lillian Pawlowski.*

*Above – Getting ready to bowl is Delores Wagner of the Signals.*

*Left – Ruth Miller holds second place on the team.*

## Teachers and Writers Visit Murray Hill

Eighty members of the New Jersey Business Education Association were guests at the Murray Hill Laboratories last month during which time they were introduced to the business methods followed by the Laboratories. Various aspects of Laboratories work were discussed by B. R. Young, F. D. Leamer and R. K. Honaman.

Visits were made to several areas of interest including the Transcription Department, a self-service stockroom, and the Concourse exhibits under the direction of several volunteer guides including J. B. Hays, G. E. Hadley, J. G. Walker, I. W. Whiteside, Hazel Reoch, Jacqueline Srill, J. T. Lowe and A. R. Brooks.

The group gathered informally in the lower lounge after 5:15. Later the same evening, Mr. Honaman was the guest speaker at the Association's dinner in the Hotel Suburban in Summit.

Another group of visitors numbering thirty-seven writers from A T & T who handle the editing and production of Bell System Practices were conducted on a tour of Murray Hill. During the course of their tour, various aspects of Murray Hill were discussed by R. H. Colley, K. M. Olsen, A. C. Walker, J. A. Carr, T. A. Durkin, C. M. Hebbert, J. T Lowe and A. R. Brooks.

## From Stamp Collector to Expert

Unlike most people, Norbert J. Eich of the Transmission Apparatus Development Department never has to fumble for a three-cent postage stamp; he has thousands of them according to a recent article in the *Newark Evening News*. In spite of this, Mr. Eich is more of a student of stamps than a collector. Besides gathering stamps, he exchanges, appraises, judges, analyses, indexes and criticizes them. According to the *News*:

"As a by-product of this zealous philatelic hobby, he has become one of the nation's foremost experts on 20th Century United States stamps.

"Stamp explorations have led him down the intricate paths of watermarking, inks, colors, gumming, printing, engraving, and paper. Through this, in turn, he has built up one of the nation's more extensive reference libraries on American stamps. He also keeps a card file listing information on every stamp he has ever owned or in which he has been interested.

" 'Philately has passed the hobby phase with me,' he said recently. 'I've gone through all three stages—hobby, obsession and study.'

*N. J. Eich and his son, Paul, discuss plate flaws in stamp collection.*

"As a member of the New York Philatelic Foundation's expert committee he has helped to set up standards for detecting counterfeits and to establish values of genuine stamps.

"The prize of Eich's collection is a booklet of current three-cent Jefferson-head stamps, which he values at from $300 to $500. Through an error in piling sheets in the printing department, one oversized page contains nine whole and three half stamps instead of the usual six. Some two billion three-cent stamps are printed each year. Eich said, but that type of error has occurred only once before in the U. S. postal department.

"Two of Eich's special interests are the study of overprints and United States Bureau issues dating from 1894. He is planning a book on the three-cent stamp with Stuart's head of Washington, for which he has gathered extensive information.

"One of his pet goals is to have issued a New Jersey commemorative stamp. Although individual events and famous persons, like Thomas A. Edison, have been recorded in stamps, there never has been a stamp honoring

this state, 'New Jersey is one of the states which has been overlooked,' Eich remarked. 'We'll probably have to wait until the bicentennial in 1976.'

"Eich is head of the plate varieties committee and of the catalogue listing committee of the Bureau Issues Association, and a member of the New York Collectors Club."

## TD-2 Radio Relay System Expanded in the Southwest

On February 15, the Austin-San Antonio TD-2 radio relay system, consisting of two broadband channels in each direction, one for telephone service and the other for protection, was placed in service. The system is being initially equipped to provide 48 telephone circuits for Long Lines and 84 circuits for the Southwestern Bell Telephone Company. Ownership of this system, which cost approximately $1,500,000, is divided between the A T & T (62 per cent) and the Southwestern Company (38 per cent). The 76-mile route between Austin and San Antonio is spanned by the use of two intermediate relay stations.

Some of the circuits derived from the radio system will be connected to Dallas-Austin and Houston-Austin "K" carrier facilities to provide message relief to those points. Future plans call for extending the TD-2 radio system to Dallas where it will connect to the southern transcontinental coaxial cable route, and north from Dallas to Oklahoma City, Wichita and Kansas City at which point it will join the coaxial cable to Omaha. This will link the Southwest with the central transcontinental radio relay system completed last August.

## News Notes

AMONG THOSE attending the annual A.I.M.E. meeting in New York were F. J. SCHNETTLER, W. G. PFANN, H. C. THEUERER, E. E. SCHUMACHER and J. H. SCAFF. Mr. Pfann presented a paper on *Principles of Zone Melting*. J. H. Scaff, as vice-chairman of the Program Committee, arranged three special programs for this meeting: *Research in Progress*, a seminar on *Theory of Metals*, and a panel discussion on *High Temperature Alloys*.

A SERIES OF Research and Progress Reports was a feature of the A.I.M.E. Institute of Metals' meetings held recently in New York. The opportunity to report on current research was participated in by a number of members of the Laboratories. M. E. FINE discussed, *The Effect of Cold Deformation and Annealing on Young's Modulus of Metals*, work in which NANCY KENNEY assisted; R. G. TREUTING reported on *Orientation Relationships in Annealed, Very Large-grained Aluminum;* and W. C. ELLIS summarized some studies of *Orientation Relationships in Cast Germanium*. JACQUELINE FAGEANT cooperated in the experimental work of the last two projects. At the same meetings, E. S. GREINER gave a paper written jointly with W. C. Ellis on *The Effect of Prior Strain at Low Temperatures on the Properties of Some Metals at Room Temperature*. These reports and papers are representative of a part of the program of fundamental study of metallic structure and properties carried out as basic to new and improved materials.

A. J. CHRISTOPHER and M. WHITEHEAD, along with representatives of Western Electric, visited the Sprague Electric Company in North Adams, Mass., to discuss problems of manufacture relating to Prokar type paper capacitors and various electrolytic type capacitors. M. Whitehead also visited the General Electric Company in Hudson Falls, N. Y., where the subjects of discussion involved the tantalum foil type electrolytic capacitor.

FOUR CRYSTAL development engineers were among the speakers at a meeting in the Arnold Auditorium of the North New Jersey Subsection of the I.R.E. W. J. CARROLL reviewed the various modes of crystal vibration and how they are obtained. L. F. KOERNER explained the advantages, long life and greater reliability, of thermistor networks in controlling constant-temperature ovens for crystals for telephone and military applications. A. W. WARNER spoke on frequency-standard crystals operated at megacycle frequencies in which range crystals can be made smaller and less susceptible to external vibration. A cause of trouble in crystal operation is excessive current, which heats a crystal, changing its frequency. L. J. LABRIE discussed this effect in AT-cut quartz plates.

WITH THE MANUFACTURE of typo-O short-haul open wire carrier well under way, R. S. DUNCAN, V. E. LEGG and C. D. OWENS visited Haverhill to discuss the problems of ferrite core inductors. The cores are made in Hawthorne, and assembled into inductors at the Haverhill plant.

A. J. CHRISTOPHER, D. A. MCLEAN, M. C. WOOLEY and J. R. WEEKS recently visited Shadeland Plant of the Western Electric Company to discuss manufacturing problems in connection with the production of metallized paper capacitors and 425B networks for the new combined set.

## RECENT DEATHS

### Reuben B. Bauer

Reuben B. Bauer, who died on March 11, was born in Greenmeadow, Minnesota, May 16, 1895, and was graduated from the University of Minnesota with a B.S. degree in 1920. His education had been interrupted by service in the U. S. Navy from 1917 to 1919. In 1922 he joined the Engineering Department of the Western and in 1925 was transferred to D & R; since the consolidation of this department in 1934 with the Laboratories he has been a member of the Technical Staff.

In his 30 years of service he made many contributions to the betterment of Bell System Plant Operations, and in World War II to the understanding of the radar equipment developed for the armed services.

During World War II he trained the radar military personnel on the operation and maintenance of radar and after the war undertook the organization of the Plant Training Program for the key instructors on the post-war dial switching developments. This included the preparation of textbooks on these systems, and planning and directing the classroom instruction on them.

He was a member of the Bell Telephone Post 497 of the American Legion.

Mr. Bauer is survived by his wife, Margaret.

### Helen V. Quinn

Helen V. Quinn came to the Laboratories from A T & T when the D & R was consolidated with the Laboratories in 1934. She had been with A T & T since 1925.

Her first assignment here was in the Systems File area. Later she joined Systems Drafting where she did circuit drafting. About ten years ago she transferred to the wiring drafting group. Here she helped in translating circuit schematics into wiring drawings for manufacture, and continued in this work until her death.

Mrs. Quinn was a very active worker in the Women's Pioneers. During the war, she knitted articles for the Pioneers' work in veterans hospitals, and had continued her knitting hobby for herself and her friends. She was also interested in ceramics, bowling, and, with her husband, rifle shooting, even to the extent of reloading ammunition.

Mrs. Quinn died on March 2. She is survived by her husband, Edwin Quinn.

### Alexander G. Souden

Alexander G. Souden of the Chemical Laboratories died on February 21. He was born October 30, 1907 in Quincy, Massachusetts. Following his graduation from M.I.T. with an S.B. degree in 1929 and S.M. in 1930, he joined the Laboratories as a member of the metallurgical group, where for several years he had an active part in non-ferrous alloy developments. Later on, he engaged in research on magnetic and varistor materials. Several patents on devices relating to these fields were issued jointly to him and his associates.

While Mr. Souden maintained an interest in sports as a spectator, his favorite form of relaxation was reading. Here his tastes varied, ranging from mysteries to historical literature.

He lived in Summit and is survived by his wife, Janet, and three children, Donald, Alexander, Jr., and Ellen.

A. G. Souden

Helen Quinn

R. B. Bauer

## Deal-Holmdel Colloquium

*Calculation Facilities Available to the Technical Staff* was the subject of a talk given by R. W. Hamming at a Holmdel meeting on February 1. The discussion was supplemented by slides, illustrating the three principal types of computers available at Murray Hill. Operation of the digital computing machine was ex-

plained with the aid of a functional block diagram. It was pointed out that the present design of the analog computer or differential analyzer is based on the World War II M-9 gun director computing mechanism.

Mr. Hamming emphasized the fact that the computing machine in itself has no brain and therefore the correct solution to an equation or problem is contingent on the intelligence used by the operator in feeding it information.

## Hobby Activity Increases at the Laboratories

A hobby demonstration and series of lectures was presented on February 27 in the West Street Auditorium by the Stamp Club, working in cooperation with the other hobby groups within the Bell Laboratories Club and the Pioneers. Dick Haard, Chairman of the Stamp Club, made arrangements for the posters, the stamp exhibits and the program.

The speakers included Max Esternaux, Walter Kuhn, and W. S. R. Smith. Mr. Esternaux, who, although a collector for only three years, is already regarded as an outstanding philatelist, discussed the aspects of stamp collecting of most common interest, how certain areas can be developed, and how a new collection may be started.

Mr. Kuhn discussed a very interesting aspect of philately, that of topical collections. In this approach, the collection is made on the basis of the subject incorporated in the design of the stamp. Thus, one collection may be of stamps that incorporate airplanes in their design, another of stamps that depict steamboats, birds, bridges, and so on. Stamp collecting offers so broad a field for hobby activity that it is necessary to be selective in approach and topical collecting is an interesting variation.


*Dick Haard, Chairman of the Stamp Club, looks over the hobby poster.*

Mr. Smith, an authority on U. S. Commemorative issues, discussed the value of stamp collecting as a tool in mental therapy, based on his experiences as Director of Philatelic Activities at Kingsbridge Veterans' Hospital. Many cases among hospitalized veterans have shown remarkable progress in rehabilitation after developing an interest in stamp collecting.

Attendance at the Stamp Club's Hobby Demonstration, which was open to all in the Laboratories, was encouraging and the success of this first lecture program indicates the growing general interest in hobbies among Laboratories people.

Recently, the 1951-1952 Hobby Committee of the Telephone Pioneers at West Street circulated a notice of their own activity in promoting hobby interest. Among the various activities of this group are a hobby library available to all employees, a hobby year book, a directory of Laboratories hobbyists and the arrangement of noon-hour lectures and demonstrations. Miss M. L. Ressler, Room 724, Extension 422, can furnish additional information on the hobby activities of the Pioneers.

*W. S. R. Smith is an authority on U. S. commemorative issues.*

## Engagements

Phoebe Barrett*—Robert C. Pickett
Jean Bartle—Lewis C. Thomas*
Elizabeth A. Keane*—William F. Clifford*
Rosemary A. Murphy*—James F. Lowery
Mary Murray*—Joseph T. Hertig
Mary Ryan—Robert A. Hawley*
Hazel Jean Smith—Watson A. Lawrence, Jr.*

## Weddings

Bernadette P. Fullhardt*—Norman F. Salveson

## Births

Jean Elizabeth, February 16, to Mr. and Mrs. Michael J. O'Leary. Mr. O'Leary is a member of the Publication Department.

Anne Theresa, January 19, to Mr. and Mrs. E. A. Hake. Mr. Hake is a member of the Power Development Group. Mrs. Hake (Marjorie McLinden) was formerly with the Laboratories. This is their fourth child.

Robert Earl, Jr., January 10, to Mr. and Mrs. R. E. Dreher. Mr. Dreher is a member of the Military Electronics Department.

Peter and Diane, February 1, twins to Mr. and Mrs. F. W. Anderson. Mr. Anderson is a member of the Power Facilities Development Department.

Eileen, February 22, to Mr. and Mrs. M. R. McCann. Mr. McCann is a member of the Systems Switching Department.

Attell Theodore, January 17, to Mr. and Mrs. A. B. Anderson. Mr. Anderson is a member of the Military Equipment Development Department at Whippany.

Patricia Anne, January 4, to Mr. and Mrs. F. B. Catalanello. Mr. Catalanello is in the Standards and Drafting Department.

Patricia Katherine, January 18, to Mr. and Mrs. Eric G. Strubing. Mr. Strubing is a member of the Development Shops.

Susan Kay, March 11, to Mr. and Mrs. John Laidig. Mr. Laidig is a member of Transmission Systems Development.

* Members of the Laboratories. Notices of engagements, weddings and births should be given to Mrs. Helen McLoughlin, Room 1321, Ext. 296.

## News Notes

I. L. Hopkins attended a meeting of the Dynamic Stresses Section of A.S.T.M. D-20 at Greenwich, and also a meeting of the Research Subcommittee of the same committee in Philadelphia. G. R. Gohn was in Philadelphia to attend the winter meeting of the A.S.T.M. Administrative Committee on Papers and Publications at which final plans were made for the technical program to be presented at the Fiftieth Anniversary Meeting of the Society in New York June 23 to 27. K. G. Coutlee attended meetings of A.S.T.M. Committee D-9 on Insulating Materials at Philadelphia and was one of the speakers on a panel discussion of insulation resistance measurements.

N. Monk presented a paper, *Public Telephone Service on Moving Trains by VHF Radio,* before the Communications Group of the Philadelphia Section A.I.E.E. Following presentation of the paper, a working installation of equipment similar to that used on the trains was demonstrated by engineers of the Bell of Pa. during which calls were made to the Pennsylvania Railroad's Broadway Limited.

A. C. Walker gave a talk on *Growing Piezoelectric Crystals* before a joint seminar group of the Textile Research Institute and the Chemistry Department of Princeton University. He also gave a similar talk before the Chemistry Alumni Club of New York University in New York City.

Mary K. Stokes, who is chairman of the New York chapter of the Society of Women Engineers, introduced the guest speakers at a symposium, *Recent Advances in Engineering,* which was held on March 15.

Pictured on the opposite page is ten-year-old Robert Bruce Whiteside, son of our own "Wally" Whiteside at Murray Hill. Robert is distantly akin to Dr. Bell, being a great-great-grandson of Isabel Bell Robinson.

The man who is seen in the advertisement on the back cover probing the future with electrons is R. D. Heidenreich. His article on this subject appeared in last month's Record.

## Picture Credits

**Cover:** Bob Isear
**Pages 175, 177:** Crawford & Keating, Newark
**Page 184:** Paul Byrne
**Page 188:** 1 Toledo Blade
**Page 195:** Call-Chronicle, Allentown
**Page 200:** Newark Evening News
**All Others:** Staff photographers of the Laboratories' Photograph Departments at West Street and at Murray Hill

# The Vision of a Man Named Bell

*Heard on the Telephone Hour*
*March 3, 1952*


**Announcer**

On March 10th, 1876, a great dream in the mind and heart of a 29-year-old inventor became a reality. Out of bits of wood, and wire, and metal had been fashioned a small instrument that, incredibly enough, transmitted the spoken word. Thus it was 76 years ago the telephone came into being, and the name of Alexander Graham Bell was inscribed in the pages of History . . . And so tonight, we celebrate the 105th anniversary of his birth.

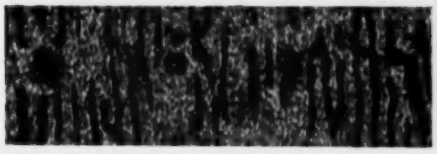
**Mr. Walter Hampden**

How does a man's dream begin? How does it grow?
It begins as a child begins – in simple faith and trust.
It wonders – as a child wonders – it dares to ask questions of the universe.
It expects answers – it finds answers.
In the tone of a plucked reed, quivering along a slender wire . . .
In the dance of the molecules across a metal disk . . .
Lifting a bridge of voices
Across the deep silence of time – and space.
This was the dream of a man named Bell.

How does a man's dream grow? It grows as a nation grows,
Eternally leaping the horizons, calling others to follow –
And the others caught up in his vision – the builders, the planners,
The lineman against the sky, the girl at her switchboard,
The scientist charting the tides of invisible sound,
The splicer sealing the joints of the cable –
All are the weavers of speech serving the nation in peace and in war
Carrying the word – across the silence of time and of space –
Along the gleaming wires – all the words of love and birth and life –
Throughout all the land – to the farthest village and town –
And beyond the dark seas – and the endless horizons beyond the earth's curve –
This was the vision of a man named Bell –
And we are the inheritors of his dream!

# Electrons probe the future

**1** Electron micrograph of an alloy of aluminum, nickel, cobalt and iron. Magnification 20,000 diameters.



**2** Cooled from high temperature in a magnetic field, the alloy becomes a powerful permanent magnet. Note changed structure. Black bars reveal formation of precipitate parallel to the applied field. Each bar is a permanent magnet.

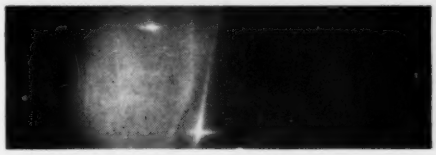
**3** A Bell scientist adjusts electron diffraction camera. Electrons are projected on the specimen at glancing angles. They rebound in patterns which tell the arrangement of the atoms . . . help show how telephone materials can be improved.

In 1927, Bell Laboratories physicists demonstrated that moving electrons behave like light waves, and thus launched the new science of electron optics.

Now, through the electron beams of the electron microscope and electron diffraction camera, scientists learn crucial details about the properties of metals far beyond the reach of optical microscopes or chemical analysis.

At the Laboratories, electron beams have revealed the minute formations which produce the vigor of the permanent magnets used in telephone ringers and magnetron tubes for radar. The same techniques help show what makes an alloy hard, a cathode emit more electrons and how germanium must be processed to make good transistors.

This is the kind of research which digs deep *inside* materials to discover how they can be made better for your telephone . . . and for defense.



**4** Diffraction pattern of polished germanium reveals minute impurities which would degrade the performance of a transistor.

**BELL TELEPHONE LABORATORIES**

Improving telephone service for America provides careers for creative men in scientific and technical fields.